FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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DIARY OF FORTHCOMING EVENTS.

Club Secretaries and others desirous of announcing the date of important fixtures are invited to send particulars for inclusion in the following list:

April 18 to May 2	Seaplane Competition at Monaco
April 21 to 28	Pacific Aeronautical Exhibition at San Francisco.
April 28 ...	Lecture on "Aerial Transport from the Business Point of View." By General Sir Sefton Brancker, Royal Society of Arts, 8 p.m. Arts, John Street, Adelphi, at 4.30 p.m.
May 1 ...	Opening date for *Daily Express* £10,000 prize competition for flight to India and back.
May 20 to 30	Pan-American Aeronautic Congress at Atlantic City.
May 22 and 23	Aviation Competition at Juvisy in connection with Fêtes de Paris
May 23 to 30	Seaplane Contests at Barcelona.
June 22 ...	Wilbur Wright Memorial Lecture, H.R.H. Prince Albert presiding, at 8 p.m., at Central Hall, Westminster. Commander J. C. Hunsaker will read a paper on "Naval Architecture in Aeronautics."
July 9 to 20	S.B.A.C. International Aero Exhibition at Olympia
July (mid.)	Seaplane Contests at Antwerp
July 24 ...	Aerial Derby.
Aug. 3 ...	Air Ministry Competition (Large and Small Type Aeroplanes)
Aug. (end of)	Schneider International Race, Venice.
Sept. 1 ...	Air Ministry Competition (Seaplanes)
Sept. ...	International aviation week (with competitions) at Brescia, Italy
Sept. 27 to Oct. 3	Gordon-Bennett Aviation Cup, France
Oct. 22 ...	Gordon-Bennett Balloon Race, Indianapolis, U.S.A.

EDITORIAL COMMENT

THE paper on "Commercial Airships" read on Wednesday before the Royal Society of Arts, by Air Commodore Maitland, calls attention to the great developments which have taken place in the construction of rigid airships in England since the beginning of the War and to their possibilities for profitable commercial use. The paper, the first part of which is reproduced in this issue of FLIGHT, is of the greatest interest, not only to those who are in touch with the progress which has been made in this branch of aircraft design and who are thus conversant with what has been achieved, but to all who are interested in the great question of the improvement in the world's communications. The author is quite right when he says that life is measured in terms of time rather than of distance, and that the matter of intercommunication between the countries of the earth is not to be measured in actual mileage, but in the time actually required to traverse the intervening space. This is tantamount to saying that every improvement in transport which leads to the saving of journey time is the equivalent of adding the amount of the saving to the individual useful lives of those who travel by the improved transport. This is a point of view which is too seldom appreciated by those who regard the modern desire for speedier

The Commercial Prospects of Airships

travel as merely a craze. It is one they might study with advantage, because it is a vital one in the affairs of the world.

To come to the consideration of the more specialised parts of the paper, we think it will be admitted by those who were present at its reading, or who have been able to peruse the printed text, that Air Commodore Maitland deserves the thanks of all who are even remotely interested in air communications for having presented the case for the big rigid airship so clearly and convincingly. There is no need for us to follow him here through all the facts and figures he advanced to prove his argument that the airship will have a place in the new transport and that it is even now possible to operate it at a commercial profit. It is enough to say that we think he succeeded in proving his proposition. His figures are conservative and based on the costs of operation ascertained during the War and since the Armistice. They are, therefore, in no sense otherwise than actual figures, as opposed to those evolved by pure guesswork, and we may therefore take them as being correct for commercial purposes. Nor did the author fall into the too common error of crediting the form of aerial transport with which he has been so closely associated with possibilities which none but the enthusiast would suppose it to possess. On the contrary, he was careful to point out that it is only over long-distance routes, where the airship would compete with sea transport, or a combination of land and sea travel, that it can effect a material saving of time. This is a point of view upon which FLIGHT has insisted whenever it has been necessary to discuss the possibilities of airship transport and we are correspondingly pleased to find that so eminent an authority as Air Commodore Maitland is in agreement as to the aforesaid limitations. For comparatively small loads the aeroplane can compete, by reason of its great speed and ease of handling, with the fastest land transport, even over short distances. The airship, with a speed limited for reasons of economy, to not over sixty miles an hour, obviously is out of court where it may have to compete with railway transport moving at an equal average speed.

The big airship is essentially a long-distance, overseas vehicle and, as the author pointed out, it is in the direction of such services as those between England and India, South Africa and Australia that it may be expected to make good. According to the figures given in the paper, an airship service should result in the saving of ten days in the passage to India. To South Africa the journey would be accomplished in a week as against 17-19 days by the mail steamer. In the case of the Australian service the saving effected should be 20 days. What this would mean in collective time saved and, as we have previously put it, useful life prolonged, is not possible to state but it is obvious that it would amount to a very considerable total of benefit to the world.

As to the actual commercial possibilities, Air Commodore Maitland quoted extensive figures to show that such services as we have named could, with no more than average good fortune, be run on such a basis as to show a profit of 15 per cent. on the capital invested. He very wisely places his operating costs at the maximum and is exceedingly conservative in all his estimates, so that, without taking too rosy a view of the possibilities, it is probable that services could be run to show an even greater margin of profit than he predicts. However that may be, it seems to us that if the figures are such as can be accepted by those who have been in negotiations with the Government for acquiring the surplus rigids for commercial use—and we think they can be so accepted—they are tempting enough to induce the business man to go into the enterprise purely on its merits. Apart from these, there is the point of view of the good of the Empire to come into the account. The establishment of airship services, linking the Motherland with the remoter Dominions, would have an immense power for good because of the shortening of time-distance and the closer association they would bring. Again, they would employ pilots, navigators, mechanics and other *personnel* of high value to the Empire in the event of another war, while they would enable us to keep well in front of other nations in the matter of design and construction. We know that Germany is still going ahead with the development of the airship for commercial purposes and unless our own business men take up the question seriously and soon we shall find that our late enemy will be first in the field with overseas airship services. From every point of view that is undesirable.

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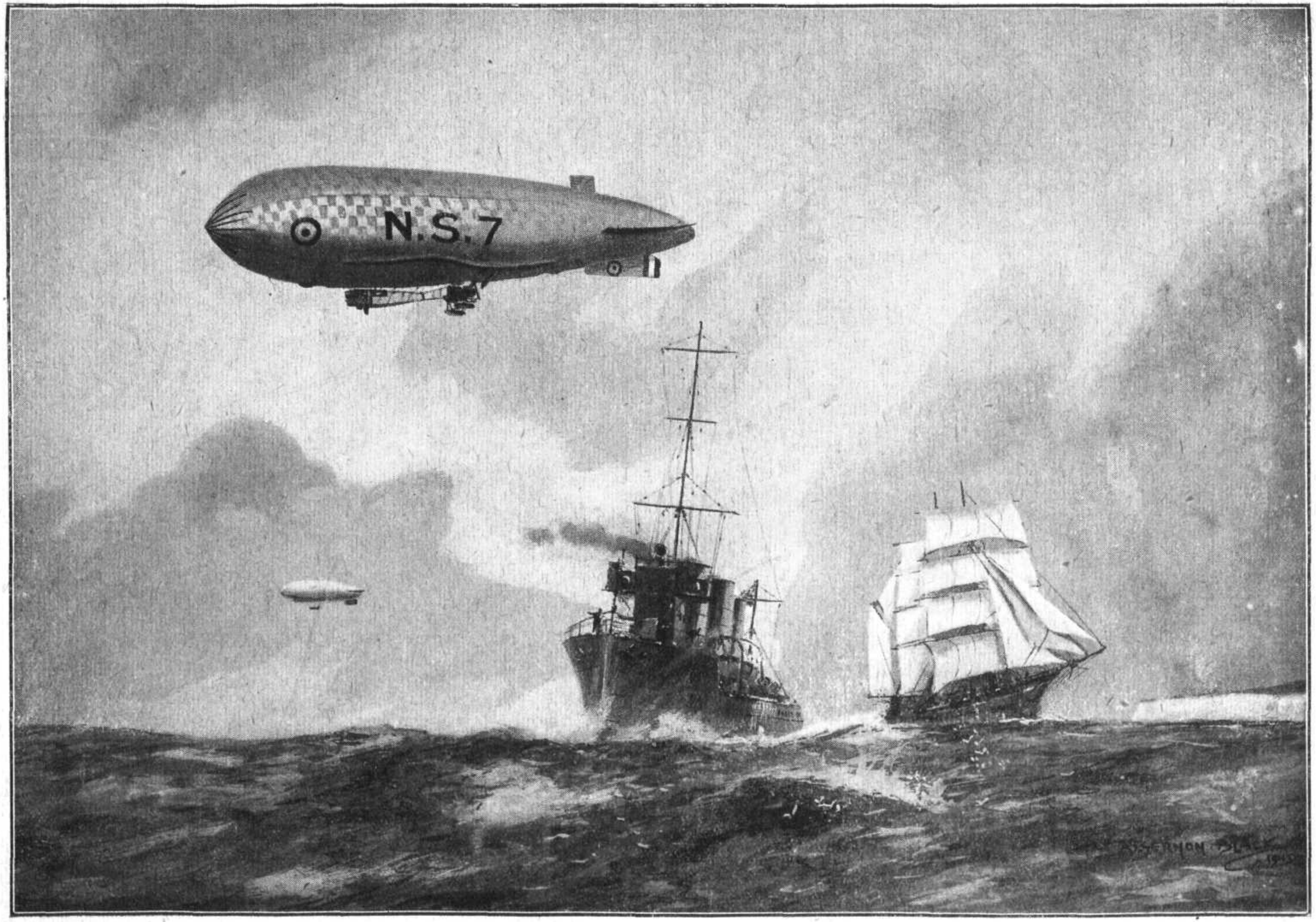
The Measure of Germany's Defeat

If, which seems probable, there are still some misguided people in Germany who think the War did not result in abject defeat of the Hun the plain figures of war material already surrendered and to be handed over to the Allies for destruction under the terms of the Peace Treaty should certainly be convincing. Mr. Churchill gave them last week in answer to a question put to him in the House. By the time the surrenders are complete Germany will have handed over no fewer than 17,800 guns and tubes, and is allowed to retain only 288 field guns and howitzers and the heavy guns in her frontier and coast fortifications, numbering another 325 or thereabouts.

One of the terms of the Treaty was, it will be remembered, that Germany should not be allowed to maintain any military or naval air forces, with the exception of a few seaplanes to assist in the location of submarine mines. It is estimated by the Air Ministry that there are now in Germany 15,248 aeroplanes, which could in a comparatively short time be made available and which would be capable of being used for war purposes. All these machines are now in process of being listed, and will be inspected by the Inter-Allied Aeronautical Commission of Control, which is the final authority for deciding which machines come under the heading of military and naval aeroplanes. All those defined under these heads will then be taken over by the Commission of Control, and this work is to be accelerated with the utmost speed.

It is good to know this, and that Germany, especially in the present state of the country, when it is not at all certain that the old militarist elements will not regain a temporary ascendancy, is not to be allowed to remain in possession of this dangerous material (including, we hope, all the necessary impedimenta required in the construction) for a day longer than is essential. As long as it is in her possession there is the risk of the worser elements succumbing to the temptation to use it. It may be that the risk is not great, but when we are dealing with such a country as Germany has shown herself to be, devoid



SAIL, STEAM AND PETROL. *From an original drawing by Algernon Black*

of the least sense of honour and prepared to treat her most solemn obligations as "scraps of paper," she has only herself to blame if we prefer to draw her teeth completely before reposing the slightest trust in her, her Government, or her people.

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Aerial Transport Costs

In the course of his paper, read before the Royal Aeronautical Society recently, Capt. Acland, general manager of the aviation department of Messrs. Vickers, Ltd., made the interesting statement that transport costs per ton-mile in respect of carriage of goods by aeroplane should not exceed 10*s*. 6*d*., equivalent to 1*s*. 5*d*. per pound for 300 miles. Obviously, in making his calculation he had in mind the distance between London and Paris, which approximates to this. Now, if it is possible to carry mail matter and goods over this distance for the relatively small sum mentioned by Capt. Acland, there is no justification for the preposterous Post Office charge of half-a-crown per letter for forwarding by aerial mail. It must be remembered that Capt. Acland in his figures deals with data which have been ascertained in practice and is not merely guessing at them. Accepting his figures, therefore, we find it very difficult to appreciate the attitude of the postal authorities in the matter. We do not want to assume that they are so completely unprogressive that they have adopted a wholly unconscionable scale of charges with the set purpose of starving out the new transport. Yet what other construction is it possible to place on their action?

At the present actual rate of postage of 2½*d*. per ounce we arrive at a figure of 3*s*. 4*d*. per pound carried, which on Capt. Acland's data is enough to show a substantial profit on a 300 miles' service. But no one expects at the present to have his letters carried by aeroplane at ordinary rates of postage, and if the rate were fixed at 6*d*. per ounce we are convinced that there would be no difficulty in securing economical loads. Sixpence per ounce is 8*s*. per pound, and between this and the costed figure of 1*s*. 5*d*. there is a very full and sufficient margin for profit and also for the possible occasional drop in revenue consequent on holidays and for other reasons which may on occasion lead to a reduction in load below the most economical maximum. We confess we do not understand the official attitude at all.

There is an excellent chance now for the Aerial Party in the Commons to press for an explanation of the Post Office outlook on the transport of mails by air. Under the Budget proposals the postage and telegraph charges are to be raised. Telegrams and telephones are to cost more. And all because, under Government control and Government trading conditions, the Post Office is unable to pay its way and has to ask for a subsidy from the taxpayer—or raise its charges. Naturally, a business which refuses to march with the times is certain to become a losing proposition. We do not for a moment suggest that it is only necessary for the Post Office to embark largely on aerial mail transport to turn its present trading deficit into a profit. What we do think, however, is that in its attitude towards the new transport the Post Office is manifesting that kind of policy which has led to its present state of embarrassed finance. As we have said, there is now a chance for those members of the House who are interested in aerial transport to force from the Postmaster-General a definite statement of his attitude towards aerial carriage of mails and to secure an explanation of why the present charges are fixed on a basis which apparently has no relation to actual costs and must have the effect of deterring the sending by aerial post of all but the most urgent mail matter.

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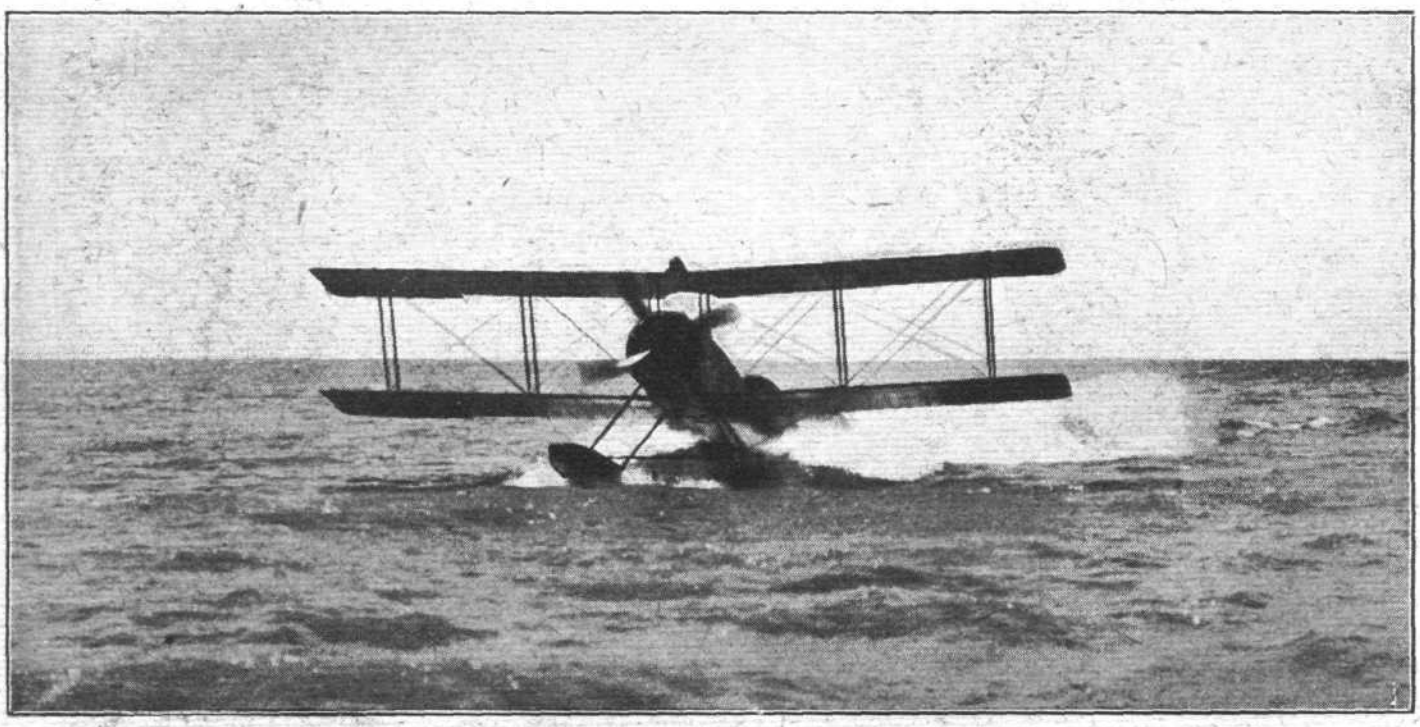
Aerial Lighthouse at Croydon

FOR the guidance of airmen, a new lighthouse has been installed at Croydon (Waddon) aerodrome. It will give one flash every five seconds, thus:—Flash one second, eclipse four seconds, and will be in operation every night from sunset to sunrise.



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A BREEZY LANDING: An Eastbourne Aviation Co.'s Avro waterplane making for the shore off Brighton

THE ADVISORY COMMITTEE FOR AERONAUTICS

THE report of the Advisory Committee for Aeronautics for 1918-19 which, although it is dated last August, has only just been issued, indicates how greatly the activities of the Committee have had to be expanded in order to cope with the many demands from the R.A.F. and the industry. The Committee has now reverted to its former practice of indicating some of the more important work carried out during the period under review, and the present report indicates not only the progress which has been made in aerodynamical research, but also in the manipulation of aircraft. It is pointed out, for instance, that as a result of the investigations carried out at the Royal Aircraft Establishment and the N.P.L., there is now practically no aspect of the complicated motion of spinning which cannot be explained and made the subject of calculation. In this connection the Committee pay a tribute to the important work to the cause of aviation rendered by the skilled pilots of the R.A.E.

Experimental work in aerodynamics has covered a large field, and the performance of full-scale machines have been compared with the results obtained with scale models in the wind channel with a view to ascertaining the relation between the wind forces in the two cases. Other wing experiments carried out relate to biplane and triplane wings, stress distribution under special conditions of flight, aspect ratio, form of wing tips, effect of "wash-out," best form and dimensions of *ailerons*, balanced *ailerons* for large machines, etc. Measurements of the distribution of pressure over the wings of a biplane in flight have been made at the R.A.E.

Notable progress has been made in the establishment of a correct airscrew theory and in its application to design, and a summary of this work is shortly to be published. Useful work has also been done towards the production of propellers of variable pitch. The distribution of velocity in the air entering a propeller, and in the slipstream, has been carefully investigated.

Progress is reported in respect of aeroplane stability, both in theory and practice. Methods have been developed for the application of stability calculations to the more complicated motions of an aeroplane and from the knowledge gained some of the earlier conceptions have been revised. It is also pointed out that the practice has been established in the trials of new aeroplanes at Martlesham Heath of taking records to determine their longitudinal stability.

The determination of the aerodynamic data required for the computation of stress distribution has proceeded steadily, and new methods of test for application to the actual aeroplane or its parts have been devised. It is pointed out that it has been the practice to make a test to destruction at the R.A.E. of one aeroplane of each new type.

Turning to airships the report points out that while the progress in airship construction has probably been relatively greater than that made in respect of the aeroplane, the advance in the study of airship theory and in the methods of experiment in relation to airships has been less marked. The measurement of the head resistance of an airship body, even in the case of a model, has been found to present many experimental difficulties, and the information obtained cannot be said to be yet by any means complete. The step from model to full-scale cannot at present be made with any approach to the accuracy requisite. It is pointed out that research work in regard to airships is bound to be expensive, but it is hoped that the Committee will not be hampered in this highly important work by financial worries. Important progress has been made in the development of the theory of airship stability, and useful work has been carried out in connection with wind-screens and the mooring of rigid airships.

Experimental work in connection with kite balloons has led to important improvements in construction and performance.

While aerodynamic tests on seaplanes model present no very distinctive features, a good deal of research has been carried out with floats and flying-boat hulls in the William Froude National Tank, resulting in the accumulation of a considerable amount of information for the guidance of designers. An interesting and important part of the work has been the investigation of the stability of a seaplane while planing, for which tests special apparatus was designed. Other tank experiments have included the determination of the best form of drogue to serve as a sea-anchor for airships.

Model experiments in the wind channel have been made in connection with the design of aeroplane carrier ships, mainly relating to the flow of air over the alighting deck, and the results have been confirmed by flying trials. An alternative scheme for an alighting stage consisting of a large number of longitudinal parallel wire ropes tensioned to as flat a catenary as possible, so forming a long flexible landing platform, has been suggested by Mr. F. W. Lanchester.

Extensive investigations have been carried out in connection with engines. It is claimed that the successful use of aluminium cylinders and pistons has been rendered possible by the researches on light alloys carried out at the N.P.L., the R.A.E., Birmingham University, and elsewhere with the close co-operation of the foundries experienced in such work. It is realised that much remains to be done to render the high-power aeronautical engine as reliable as those used for other forms of locomotion, and a great part of the research work has been directed towards determining the causes of failure in practice, such as crankcase breakages, crankshaft failures, burning of valves, piston troubles, ignition, etc. The question of engine cooling has come in for a good deal of attention. This is an aerodynamic as well as an engine problem, and its solution must always be a matter of compromise. On air cooling a large amount of work has been done, and the radiator problem has been fully studied.

Another matter to which attention has been given is the determination of the loss of power with height, *i.e.*, with reduction of air density, and generally the testing of engines under high altitude conditions. Means of reducing the loss of power at a height have been investigated, especially the question of super-compression, and the use of a blower to maintain the air pressure.

The work in connection with light alloys has proceeded on two main, but very distinct lines: 1. Wrought alloys of high tensile strength for rigid airship construction and other aircraft work where they can replace steel with a saving in weight; and 2. Cast alloys which are needed for engine cylinders, pistons and crankcases. Since 1914 the Laboratory has been equipped on a semi-manufacturing basis and special attention has been given to heat treatment, and full details of the development of wrought alloys are to be published shortly. Many new alloys have been rendered available for various purposes in the future, and the metals used include aluminium, copper, zinc, tin, magnesium, iron, nickel, manganese, chromium, vanadium, cobalt and beryllium; aluminium is usually the main ingredient, but alloys with magnesium as a base have also been investigated.

Among other work carried out on aluminium alloys may be mentioned the production of thin sheet to replace fabric for wing covering; a satisfactory procedure for the manufacture of sheet of the requisite thickness has been developed at the N.P.L., and methods of fixing it to the wing have been devised.

Many meteorological problems have also been investigated, among them one in connection with what has been described as a "wind barrage" met with by an airship attempting to cross the sea coast landwards in the neighbourhood of St. Abb's Head. This has led to valuable experiments on the effect of eddies on the motion of an airship travelling through them. Another investigation is that which seeks to give protection to kite balloons from atmospheric electrical discharges.

Dopes and fabrics have continued to receive a good deal of attention, and important investigations have been directed to reducing the rate of deterioration, with loss of gas-tightness of airship fabrics, in the tropics. Considerable assistance has been rendered by the X Aircraft Depôt, Aboukir, and it has been established that the deterioration is due almost entirely to the actinic radiation of sunlight, and that considerable protection can be afforded by introducing pigment into the outer layer of rubber.

The equipment of the Laboratory now includes one 3-ft., two 4-ft., three 7-ft. wind channels, and a new channel, 7 ft. by 14 ft., is being installed for tests on large aeroplane models. In addition the R.A.E., has a 4-ft. and a 7-ft. wind channel and a second 7-ft channel is being installed.

The Committee concludes by urging once again the immediate importance of greatly increased activity in the investigation of the new problem of flight, which is undoubtedly destined to exercise an ever-increasing influence on the future history of the world. There is the more need that we should not be sparing in expenditure on work for which the returns will perhaps not be immediate, but which will surely repay its cost a thousandfold to the Empire which our sons and daughters will rebuild.

Attached to the report is a supplement in which some details are given of the work which has been carried out as well as the tables which are reproduced on the following pages.

NOTABLE PERFORMANCES OF BRITISH AEROPLANES.*

SINGLE-SEATER MACHINES.

Type.	Engine.	Max. speed, m.p.h. as stated.	Height of max. speed.	Speed in m.p.h., and r.p.m. at 10,000 ft.				Rate of climb at G.L., ft. per min.	Time in mins., rate of climb in ft. per min., and r.p.m. at 10,000 ft.							Ceiling, ft. approx.	Max. height reached.	Weight.					Useful load.	Date of Trial report.	Place of Trial.
				At 6,500 ft.	At 10,000 ft.	r.p.m.	At 15,000 ft.		6,500 ft.		10,000 ft.			15,000 ft.				Gross =	Empty +	Fuel and oil. +	Mily. load +	Crew.			
									Time.	Rate.	Time.	Rate.	r.p.m.	Time.	Rate.										
																	ft.						lbs.		
Martinsyde Scout	120 Aus. Daim.	93	G.L.	—	—	—	Data incomplete			—	20·5	—	—	51	—	—	15,000	—	—	—	—	—	—	9.15	U.
Vickers Scout	100 Mono.	118	G.L.	—	—	—	Data incomplete			—	—	—	—	—	—	—	—	1,130	—	—	—	—	—	11.15	U.
F.E. 8	100 Mono.	94·5	G.L.	—	—	—	—	—	11	Test	incomplete.			—	—	—	—	1,346	895	232	39	180	451	11.15	U.
B.E. 12	150 R.A.F. 4A	103	G.L.	97	91	—	—	—	95	490	18·8	260	—	—	—	12,500	—	2,104	1,540	283	101	180	564	2.16	U.
F.E. 8	110 Le Rhone	—	—	—	89	—	—	1,050	9·3	700	17·3	580	—	—	—	—	—	1,470	960	280	50	180	510	4.16	F.
Vickers Scout	110 Le Rhone	117·2	G.L.	109†	—	—	—	1,150	7·7	605	14·8	465	1,125	32·5	256	—	16,000	1,617	1,068	300	89	160	549	5.16	U.
Bristol Mono. P.L.	110 Clerget	128	5,400	127	118	—	110·5	1,800	4·8	1,080	8·5	830	—	17·4	320	17,000	—	1,326	913	183	50	180	413	7.16	U.
Sopwith Triplane	130 Clerget	—	—	116	114	1,220	105	—	6·3	870	10·6	790	1,025	19·0	460	—	17,000	1,415	993	184	58	180	422	12.16	E.
Martinsyde	190 Rolls-R.	—	—	126·5	122	—	115	—	5·9	900	10·3	670	1,790	19·3	440	24,500	19,000	2,234	1,730	214	110	180	504	2.17	M.
S.E. 5A	200 Hispano	123	14,000	—	—	—	121	—	6·0	915	10·3	725	1,780	18·8	465	23,000	—	1,953	1,400	266	107	180	553	5.17	M.
Sopwith Camel	110 Le Rhone	—	—	—	108·5	1,235	103	—	5·2	1,035	9·0	790	1,110	17·3	455	—	—	1,408	889	238	101	180	519	5.17	M.
Martinsyde	Rolls Fn. III	132·5	5,000	131·5	130	—	127·5	1,810	4·2	1,315	7·3	1,075	—	12·8	725	25,000	—	2,261	1,740	240	101	180	521	6.17	M.
S.E. 5A	200 Hispano	—	—	132	128	1,990	115·5	—	6·0	765	11·3	580	1,710	22·9	305	19,000	—	2,034	—	—	—	180	500?	7.17	M.
Vickers F.B. 16D	200 Hispano	135	10,000	—	135	—	126	—	6·0	900	10·4	675	1,800	20·8	345	18,500	—	1,875	1,376	231	88	180	499	7.17	M.
Martinsyde	Rolls Fn. Exp.	138	10,000	—	138	—	132·5	1,870	4·0	1,405	6·8	1,150	—	11·9	790	26,000	22,550	2,325	1,790	254	101	180	535	11.17	M.
Sopwith Snipe	A.B.C. Dfly.	141	15,000	—	—	—	141	—	—	—	7·5	1,080	—	13·0	700	25,000	25,000	2,132	1,405	344	203	180	727	2.19	F.
Martinsyde F.4.	300 Hispano	142·5	10,000	—	142·5	—	136·5	1,875	4·0	1,415	6·7	1,175	—	11·8	830	26,700	24,700	2,289	1,710	298	101	180	579	6.18	M.
Martinsyde F. 4	300 Hispano	145	50,000	144·5	143·5	—	139·5	2,000	4·0	1,355	6·9	1,100	1,605	12·3	760	26,000	—	2,289	1,710	298	101	180	579	8.18	M.
Sopwith Snipe	A.B.C. Dfly.	—	—	—	142	—	—	—	—	—	5·5	1,365	—	9·9	875	—	20,300	1,927	1,471	276	—	180	456	1.19	F.
Bristol Scout	Mercury	—	—	—	143	—	136	—	—	—	5·5	1,420	—	9·9	980	25,000	23,760	1,800	1,365	213	42	180	435	3.19	F.
TWO-SEATER MACHINES.																									
Grahame-White	100 Mono.	87	G.L.	—	—	—	Data incomplete			—	—	—	—	—	—	—	3,500	—	—	—	—	—	—	8.15	U.
B.E. 2C	90 R.A.F. 1A	82	G.L.	—	—	—	Data incomplete			—	—	—	—	—	—	—	4,000	—	—	—	—	—	—	8.15	U.
De H. Fighter	100 Mono.	93	G.L.	—	—	—	Data incomplete			—	18·5	—	—	—	—	—	10,000	—	—	—	—	—	—	12.15	U.
Sopwith Biplane	110 Clerget	105	G.L.	—	—	—	Data incomplete			—	20·8	310	—	—	—	—	14,000	—	—	—	—	—	—	1.16	U.
B.E. 2C	150 Hispano	94·9	G.L.	91	86	—	—	750	13·3	350	26·1	294	—	—	—	14,000	13,000	2,350	1,750	200	80	320	600	4.16	U.
Morane Biplane	110 Le Rhone	—	—	—	83	—	—	—	13·0	400	26·8	190	—	—	—	12,000	—	1,677	1,082	225	30	340	595	5.16	F.
Armstrong-Whit.	105 R.A.F. 1B	—	—	88	80	1,700	—	—	12·0	380	23·5	210	1,680	—	—	13,000	—	2,010	1,375	235	80	320	635	6.16	U.
Armstrong-Whit.	160 Beardmore	98·4	G.L.	95	88	—	—	—	15·4	330	27·8	240	1,160	—	—	16,000	13,000	2,811	1,916	402	133	360	895	6.16	U.
R.E. 8	150 R.A.F. 4A	106·5	1,600	99	93	—	—	—	11·7	390	22·0	260	1,600	—	—	16,000	13,200	2,604	1,627	409	208	360	977	7.16	F.
De Havilland 4	200 b.h.p.	108·5	11,200	—	—	—	—	1,000	9·6	600	16·4	430	—	32·5	220	20,000	15,500	2,945	—	—	—	—	935	10.16	U.
De Havilland 4	200 b.h.p.	112·5	4,000	112	109	—	103	—	11·0	510	19·0	370	1,190	—	—	20,500	15,300	3,146	2,010	340	436	360	1136	9.16	U.
De Havilland 4	200 b.h.p.	118	1,500	117	113	—	105	1,100	9·5	625	16·3	430	—	29·0	310	?	16,000	2,945	2,010	390	185	360	935	9.16	U.
Bristol Fighter	190 Rolls-R.	—	—	105	101	1,900	96	—	7·5	700	14·5	400	1,690	31·0	250	16,000	—	2,663	1,727	396	180	360	936	10.16	U.
De Havilland 4	250 Rolls, Mk. 3	119	3,000	117	113	1,650	102·5	—	8·9	550	16·4	380	1,520	26·7	150	16,000	—	3,313	2,303	465	185	360	1010	3.17	M.
De Havilland 4	200 R.A.F. 3A	120	6,500	120	117·5	—	110·5	—	8·0	650	14·2	470	—	29·3	220	17,500	17,000	3,340	2,304	510	166	360	1036	4.17	M.
Martinsyde	200 Hispano	—	—	—	114	2,135	107	—	7·7	680	13·5	525	—	26·3	270	17,000	—	2,355	1,547	263	185	360	808	5.17	M.
De Havilland 4	260 Fiat	—	—	110	106·5	1,330	—	—	14·0	350	26·7	205	1,250	—	—	14,000	—	3,822	2,306	501	655	360	1516	7.17	M.
Bristol Fighter	Rolls Falcon 2	125	3,000	119	113	1,995	105	1,180	6·5	830	11·25	645	—	21·3	375	21,500	—	2,779	1,934	300	185	360	845	8.17	M.
De Havilland 4	375 Rolls Eagle	136·5	6,500	136·5	133·5	—	126	1,435	5·2	1,042	9·0	830	—	16·5	525	23,500	18,000	3,472	2,403	524	185	360	1069	8.17	M.
De Havilland 4	375 Rolls Eagle	—	—	—	—	—	128	—	—	—	—	—	—	—	—	—	—	3,472	—	—	—	—	1069	9.17	M.
Sopwith Bulldog	A.B.C. D'fly	—	—	—	131	—	108	—	—	—	8·1	890	..	15·5	600	?	—	2,277	—	—	—	—	—	—	F.
De Havilland	Napier	137	10,000	—	137	—	132	—	—	—	7·2	1,140	—	13·0	740	25,800	25,800	3,667	2,554	568	185	360	1113	9.18	F.
De Havilland 9	Napier Lion	140	10,000	—	140	—	135	1,550	4·9	1,160	8·2	940	—	14·6	640	25,300	22,650	3,725	2,602	578	185	360	1123	11.18	M.
De Havilland 9	Napier Lion	—	—	—	—	—	—	1,970	3·9	1,400	6·75	1,095	—	12·6	650	30,500	27,350	3,440	—	—	—	—	815	1.19	M.

The performance data given in these Tables are taken from reports issued by the Testing Squadrons. The heights given are those corresponding with mean atmospheric conditions.

* All performances in these Tables are for a Standard atmosphere. † At 8,000 ft. U = Upavon. F = Farnborough. E = Eastchurch. M = Martlesham.

MULTI-SEATED MACHINES.

Type.	Engine.	Max. speed m.p.h. as stated.	Height of max. speed.	Speed in m.p.h., and r.p.m. at 10,000 ft. At 6,500 ft.	At 10,000 ft.	At 15,000 ft.	Rate of climb at G.L. ft. per min.	Time in mins., rate of climb in ft. per min., and r.p.m. at 10,000 ft. 6,500 ft. Time.	Rate.	10,000 ft. Time.	Rate. and r.p.m.	15,000 ft. Time.	Rate.	Ceiling ft. approx.	Max. height reached.	Weight. Gross	= Empty	+ Fuel and oil.	+ Mily. load	+ Crew.	Useful load.	Date of Trial report.	Place of Trial.
															ft.						lbs.		
F.E. 4 (P. 3)	2 R.A.F. 5 ..	84·3	G.L.	—	—	—	220	47	55	—	—	—	—	7,000	6,600	—	—	1,365	40	540	1,945	5.16	U.
Avro-twin (T. 3) ..	2 190 Rolls R.	94	8,000	—	89	—	735	11·4	430	21·7	260	—	—	16,000	14,000	6,309	4,376	1,120	273	540	1,933	6.17	M.
Avro-Twin (T. 3) ..	2 200 b.h.p. ..	106	10,000	—	106	93	920	9·1	555	16·5	400	34·1	200	20,000	17,000	6,050	—	—	—	540	?	11.17	M.
De H. 10 (T. 3) ..	2 400 Libertys	113·5	10,000	—	113·5	105	860	9·3	560	16·6	400	35·3	165	18,600	16,100	8,500	5,600	1,435	925	540	2,900	7.18	M.
De H. 10 (T. 3) ..	2 400 Libertys	120 –	3,000	117·5	115	110	965	8·2	650	14·6	470	29·9	220	19,500	17,400	8,500	—	—	—	—	2,915	8.18	M.
De H. 10 (T. 3) ..	2 400 Libertys	120	3,000	119	116·5	—	1,020	7·7	695	13·4	525	26·3	275	20,500	—	8,500	—	—	—	—	2,915	8.18	M.
De H. 10A (T. 3) ..	2 400 Libertys	130	5,000	128	124	117	1,170	6·4	860	11·0	675	20·6	380	19,000	17,500	8,500	5,750	1,756	454	540	2,750	9.18	M.
Handley Page (T. 4) O.400	2 275 Rolls II	91·5	5,000	88·5	80	—	495	20·3	215	42·6	113	—	—	14,000	10,000	12,230	8,480	2,830	200	720	3,750	9.17	M.
BristolBraemar (T.&P. 4)	4 Sid. Pumas	107	5,000	101	95	—	760	16·0	295	31·7	160	—	—	11,500	13,800	14,578	9,878	3,635	345	720	4,700	10.18	M.
Handley Page (T. & P. 6) V. 1500	4 Rolls, Eagle 8	97 at	8,750	—	—	—	450	18·5	220	—	—	—	—	12,800	8,750?	24,700	16,210	4,290	3,120	1,080	8,490	9.18	M.

Weight empty includes cooling water for water-cooled engines.

SEAPLANES AND SHIP AEROPLANES

Type	Engine	Normal b.h.p. and r.p.m. at G.L.	Lifting surface.	Speed in knots At 2,000 ft.	At 6,500 ft.	At 10,000 ft.	Time in mins., and rate of climb in ft. per min. 2,000 ft. Time	Rate	6,500 ft. Time	Rate	10,000 ft. Time	Rate	Air En-durance	Service ceiling (ft.)	Weight. Gross	= Empty.	+ Fuel and oil.	+ Military load.	+ Crew.	Loading. Lbs. per sq. ft.	Lbs. per h.p.	Date of trial report.
Ship Aeroplanes—																						
Parnall Panther (T 2)	230 B.R.2 ..	228 at 1,300	325	—	94	89·5	2·3	795	9·3	545	17·1	345	4¼ at 10,000′	14,500	2,595	1,328	541	366	360	8·0	11·4	5/18
Sopwith Camel (T 1)	150 B.R.1 ..	150 at 1,250	229	108	105·5	103	1·8	1,278	6·2	752	11·4	541	—	17,500	1,530	1,036	223	91	180	6·7	10·2	10/17
Sopwith Torpedo (T 1)	Sunbeam Arab	207 at 2,000	568	90·5	89	85	4·0	466	15·7	303	31·0	176	4 at 10,000′	12,000	3,883	2,199	405	*1,099	180	6·8	18·75	6/18
Float Seaplanes—																						
Fairey Campania (T 2)	275 Rolls, Mk.I	307 at 1,800	654	76	72	—	5·6	307	28·5	120	—	—	4½	7,000	5,406	3,613	783	650	360	8·3	17·6	6/17
Fairey 3B (T 2) ..	Sunbeam Maori	265 at 2,100	570	79	75·5	—	4·3	410	19·5	210	—	—	—	9,000	5,083	3,423	610	690	360	8·9	19·2	10/18
Fairey 3C (Normal load) (T 2) ..	Rolls Eagle 8	359 at 1,800	476	96	93	89	2·3	794	9·3	510	18·0	332	5½ at 6,000′	15,000	4,800	3,392	878	170	360	10·1	13·4	10/18
Fairey 3C (Over load) (T 2)	Rolls Eagle 8	359 at 1,800	476	87·5	83	—	3·7	500	16·5	246	44·0	48	5 at 6,000′	8,500	5,039	3,549	883	247	360	10·6	14·0	3/19
Short Improved 184 (T 2)	260 Sunbeam	265 at 2,100	680	73	72	70	6·3	300	26·3	165	—	—	4½	9,000	5,123	3,479	637	647	360	7·5	19·9	9/17
Boat Seaplanes—																						
F.2A (T 4)	2 Rolls Eagle 8	2×345 at 1,800	1,133	83	77	70	3·8	470	16·7	252	39·5	86	6 at 1,000	9,500	10,978	7,549	2,124	585	720	9·7	15·9	3/18
F. 3 (Normal load) (T 4)	2 Rolls Eagle 8	2×345 at 1,800	1,430	79	74·5	—	5·4	333	24·0	163	—	—	6 at 2,000	8,000	12,235	7,958	2,096	†1,461	720	8·55	17·7	4/18
F. 3 (Over load) (T 4)	2 Rolls Eagle 8	2×345 at 1,800	1,430	78	75·5	—	7·8	230	41·0	75	—	—	—	6,000	13,281	7,958	3,142	†1,461	720	9·3	19·25	4/18
F.5 (Normal load) (T 4)	2 Rolls Eagle 8	2×345 at 1,800	1,409	89	86	78·5	4·0	462	16·1	290	32·5	160	7 at 6,000	11,500	12,268	8,023	2,097	†1,428	720	8·7	17·8	5/18
F. 5 (Overload) (T 4)	2 Rolls Eagle 8	2×345 at 1,800	1,409	88·5	80·5	—	5·3	352	22·5	193	—	—	7 at 6,000	9,000	13,306	8,023	3,121	†1,442	720	9·4	19·3	5/18
H. 16 (T 4) ..	2 Rolls Eagle 8	2×345 at 1,800	1,200	85·5	83·5	80	3·7	512	14·6	335	28·0	198	6 at 2,000	12,500	10,670	7,363	2,115	472	720	8·9	15·5	5/18

NOTE.—Loading lbs. per h.p. .. Gross weight ÷ actual h.p. developed at normal revs.
Lifting surface .. Surface of wings and flaps only.
Military load .. .. Weight of guns, bombs, ammunition and reconnaissance load.
Air endurance .. .. At 10,000 ft. alt., at full throttle, including climb.
Service ceiling .. .. Height at which rate of climb is 100 ft. min.
Weight empty .. Includes cooling water for water-cooled engines.

Type: T = Tractor; P = Pusher. The figure in brackets indicates number of seats.

* 18-inch torpedo. † With four 230-lbs. bombs.

AIRSHIP PERFORMANCE TABLE.

	Length.	Diameter.	Max. overall Height.	Max. overall Width.	Nominal Capacity. C.F.	Nominal Lift.	Total Fixed Weight.	Disposable Lift.	Disposable Gross Lift.	Dischargeable Lift.	Dischargeable Gross Lift.	Petrol Capacity.	Total Nominal h.p.	Types of Engines.	Maximum Full Speed.	Normal Full Speed.	Cruising Speed.	Static Ceiling.	Max. Range at Normal Full Speed.	Maximum Range at Cruising Speed.	Max. Endurance at Normal Full Speed.	Max. Endurance at Cruising Speed.	Guns Weight and Ammunition.	Armament Bombs.	Normal Crew.	Crew Accommodation.
	ft. in.	ft. in.	ft. in.	ft. in.		tons.	tons.	tons.	p.c.	tons.	p.c.	tons.		h.p.	m.p.h.	m.p.h.	m.p.h.	ft.	miles.	miles.	hrs.	hrs.	lbs.	lbs.		
Non-Rigid:																										
N.S. ..	261 5	56 4	68 10	58 0	374,000	11·35	6·99	4·36	38·4	3·29	29	3·29	520	2 260 Fiat ..	60	56 (480 h.p.)	45	9,000	1,500	2,800	27	62	155	4 230	10	5
C. Star..	217 0	44 1	55 9	50 0	210,000	6·38	4·71	1·67	26·1	1·1	17·8	1·14	360	1 260 Fiat .. 1 100 Berliet	55	51	42	5,000	740	970	14	23	77	2 230	5	2
S.S. ..	143 4	30 0	44 5	39 6	70,000	2·12	1·4	0·72	33·8	0·38	17·8	0·26	75	1 75 Rolls Royce.	54	50	40	4,000	660	700	13	17½	77	2 65	3	—
S.S.Twin	157 2	34 6	48 0	42 10	93,000	2·82	1·93	0·89	31·6	0·52	18·4	0·33	150	2 75 Rolls Royce.	65	60	50	6,000	510	560	8½	11	77	2 230	5	—
Rigid:																										
R. 23	535 0	53 0	84 0	68 0	942,000	28·6	22·6	6	21	3·35	11·7	2·25	1,000	4 250 Rolls Royce.	53	50 900 h.p.	45 750 h.p.	3,600	500	540	10	12	490	4 100	17	9
R. 29 ..	539 0	53 0	81 6	63 0	990,600	30·07	21·41	8·66	28·8	5·95	19·8	4·5	1,100	4 275 Rolls Royce.	56·6	53 950 h.p.	45 770 h.p.	6,900	1,015	1,050	19	23·4	490	4 230	17	9
R. 32 ..	614 6	65 7	81 4	65 7	1,553,000	47·14	30·71	16·43	34·85	12·2	25·85	7·5	1,250	5 250 Rolls Royce.	67	64 1,125 h.p.	45 485 h.p.	9,000	1,710	2,785	26·7	61·9 2d. 13.9hr.	550 980	2 520 4 230	21	10
R. 33 ..	639 5	78 9	91 7	78 9	1,958,000	59·4	32·85	26·55	44·7	21·21	35·7	15·27	1,250	5 250 Sunbeam.	63·5	60·5 1,125 h.p.	45 560 h.p.	13,800	3,286	4,905	54·3	109 4d. 13hr.	800 700 1 1½-pr.	4 520 8 230	26	13

THE GRAND PRIX DE MONACO

BY THE TECHNICAL EDITOR

Monaco, Friday, April 16.

As one steps off the train at Monaco the sun, which has hitherto been obscured by low clouds, breaks through its barrier, and the bay of Monaco, backed by its mountains, is bathed in brilliant sunlight. Down in the diminutive harbour motor-boats, sailing and rowing-boats are passing to and fro, in and out through the narrow inlet, which is guarded on one side by a red light and on the other by a blue. The firing of a signal gun indicates that one of the motor-boat races is about to start. In a moment the various racers in the harbour seem to spring to life; there is a roar of engines and out through the harbour mouth comes a succession of high-power motor-boats with the spray flying almost to the top of the two tiny lighthouses. One notices among them the already famous *Sunbeam-Despujols III*, which has reaped much glory since the beginning of the racing. As things turn out, this boat puts up another victory to its credit, being again first in today's race, which is the second heat of the "Championship of the Sea." One cannot help feeling a certain amount of patriotic pride in the engine which has so consistently pushed *Despujols III* to victory.

Then, with a start one recalls that the object of one's visit to Monaco is not connected with motor-boat racing, but has to do with certain winged creatures, some of which bear a strong family resemblance to the motor-boat. A round of the harbour, however, reveals nothing very startling; in one corner is found an old, pre-War type, pusher seaplane (Farman) sitting on the slip, but whether or not it ever goes out does not seem certain. It is of the type which has H. Farman wings and M. Farman *nacelle*, commonly known as the "Horice" Farman. A little farther along one comes across a couple of Donnet-Leveque flying-boats, also of somewhat antique appearance, one of which has the curious turned-up scorpion-like tail of pre-War days. The other is a little more modern, but it also appears to have seen much service. That it is intended for participation in the coming competition seems unlikely, although later in the day it leaves for parts unknown, making a very clean get-off and, in fact, coming "unstuck" (not a very elegant word, although expressive) in the harbour mouth itself, after a very short run.

So far one has seen no machine which can be directly associated with the Grand Prix de Monaco. In the eastern corner of the harbour, however, a structure is noticeable, which gives promise of growing some day into a diminutive hangar and a closer inspection reveals the fact that it "houses" one of the Spads entered for the competition. The machine appears to be of more or less standard Spad design, with two large single-step, vee-bottom floats. The engine is a Hispano-Suiza of 300 h.p. Next to the Spad is a Nieuport, type 29 G, also with Hispano engine. This machine is very similar to those exhibited at the Paris Aero Show, and to that seen at the Schneider "race" of sad memory at Bournemouth last year. The floats, however, are of the type with which Nieuport had such considerable success before the war. There is a central 3-stepped keel about 10 in. wide, from which the bottom slopes slightly towards the chines. It will be interesting to see which type of float behaves the better. The Nieuport floats are fairly short and of generous beam, and a streamline tail float is provided. In anything of a sea it seems probable that the machine with the short floats and a tail float will fare better than one with long main floats and no tail float.

Saturday, April 17.

The weather has changed; it is cloudy and a strong breeze is blowing. The sea is distinctly rough with quite a showing of whitecaps. There are still no signs of any of the other machines. It is said that most of them are delayed by transport difficulties. The Savoias are rumoured to be side-tracked somewhere or other, but more probably they will be flown across as the distance is not very great. M. Sadi Lecointe has gone to St. Raphael to see if he can find the Sunbeam-engined Nieuport. *On dit* that the Donnet-Leveques will not be ready, and of the Loire and Olivier flying boats, as well as of the Fairey seaplane* and British boats entered by Portugal, there is not even a rumour. It is now stated that probably the seaplane competition will not commence until Monday or Tuesday. In any case, the weather is at present highly unfavourable even were the machines ready.

[*The unfortunate circumstances that have compelled the selected pilot for this machine, the only British entry, at the last moment to go to America, may probably preclude the Fairey from participating in the competitions.—Ed.]

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

SPECIAL COMMITTEE MEETING

A SPECIAL MEETING of The Committee was held on Wednesday, April 14, 1920, when there were present :—Brig.-Gen. Sir Capel Holden, K.C.B., F.R.S., in the Chair, Mr. Ernest C. Bucknall, Squadron-Leader T. O'B. Hubbard, M.C., R.A.F., Lieut.-Col. F. K. McClean, Lieut.-Col. J. T. C. Moore-Brabazon, M.C., M.P., Lieut.-Col. Alec Ogilvie, Lieut.-Col. Mervyn O'Gorman, C.B., Mr. F. Handley Page and the Secretary.

Election of Chairman.—Brig.-Gen. The Duke of Atholl, K.T., M.V.O., D.S.O., was unanimously elected Chairman of the Club for the current year.

Election of Vice-Chairman.—Brig.-Gen. Sir Capel Holden, K.C.B., F.R.S., was unanimously elected Vice-Chairman of the Club for the current year.

Stewards of the Club.—The following were elected Stewards of the Club for the current year, subject to their consent :—

The Earl of Lonsdale.
The Rt. Hon. Lord Hugh Cecil, M.P.
The Lord Kinnaird, K.T., F.R.G.S., J.P., D.L.
Admiral of the Fleet The Right Hon. Sir Edward Seymour, G.C.B., O.M., G.C.V.O.
The Hon. Arthur Stanley, M.V.O., M.P.
Lieut.-Gen. Sir David Henderson, K.C.B., D.S.O.

Appointment of Sub-Committees.—The following Sub-Committees were appointed for the current year :—

Technical Committee

Capt. W. G. Aston.
Mr. Griffith Brewer.
Eng.-Comdr. W. Briggs, R.N.
Squadron-Leader T. O'B. Hubbard, M.C., R.A.F.
Air-Commodore E. M. Maitland, C.M.G., D.S.O., R.A.F.
Maj. R. H. Mayo.
Lieut.-Col. Alec Ogilvie.
Lieut.-Col. Mervyn O'Gorman, C.B.
Mr. F. Handley Page.
The Viscount Tiverton.
Lieut.-Col. H. T. Tizard.
Mr. Howard T. Wright.

Racing Committee

Mr. G. B. Cockburn.
Air-Commodore E. M. Maitland, C.M.G., D.S.O., R.A.F.
Group-Capt. C. R. Samson, C.M.G., D.S.O., R.A.F.

House Committee

Maj. H. Graeme Anderson.
Mr. Ernest C. Bucknall.
Mr. Herbert J Corin.
Mr. C. G. Greenhill.
Mr. Henry Knox.
Lieut.-Col. F. K. McClean.
Mr. J. Stewart Mallan.

Finance Committee

Mr. Ernest C. Bucknall.
Lieut.-Col. F. K. McClean.
Mr. J. H. Nicholson.
Lieut.-Col. Alec Ogilvie.

Flying Services Fund Committee

H.R.H. Prince Albert, K.G.
Lieut.-Col. Alan Dore, D.S.O.
Mr. Chester Fox.
Squadron-Leader T. O'B. Hubbard, M.C., R.A.F.
Group-Capt. C. R. Samson, C.M.G., D.S.O., R.A.F.

Library Committee

Mr. C. G. Grey.
Squadron-Leader T. O'B. Hubbard, M.C., R.A.F.
Maj. C. C. Turner.
Mr. Howard T. Wright.

Joint Standing Committee of the Royal Aero Club and the Society of British Aircraft Constructors

The following were appointed to represent the Royal Aero Club :—

Squadron-Leader T. O'B. Hubbard, M.C., R.A.F.
Lieut.-Col. F. K. McClean.
Lieut.-Col. J. T. C. Moore-Brabazon, M.C., M.P.
Lieut.-Col. Alec Ogilvie.

Air League.—The following were appointed to represent the Club on the Executive Committee of the Air League :—

Brig.-Gen. Sir Capel Holden, K.C.B., F.R.S.
Lieut.-Col. F. K. McClean.

Election of Members.—The following New Members were elected :—

Andrew Bryning.
Lieut.-Col. Alan Sydney Whitehorn Dore, D.S.O.
Peter Ralph Purves.

Aviators' Certificates.—The following Aviators' Certificates were granted :—

7860. Frank George Gibbons.
7861. Aubrey Wilson Higson.
7862. Osborne Briaris Thompson.
7863. Arthur Francis Brooks Broadhurst.
7864. Artur Pent (Esthonian Subject).
7865. Villem Valdman (Esthonian Subject).
7866. Richard Pette (Esthonian Subject).
7867. Ole Dynes Birch Andersen (Danish Subject).
7868. Henrik Christian Sorensen (Danish Subject).
7869. Frants Edmund Elias Abrahamsen (Danish Subject).
7870. Aage Jens Victor (Danish Subject).

"Daily Express" £10,000 Prize Flight from Great Britain to India and Back

Intending Competitors are reminded that this Competition is open on May 1, 1920.

The Entry Fee is £100. This fee, together with Entry Form, must be received by the Royal Aero Club, 3, Clifford Street, London, W. 1, at least fourteen days before the start.

The following Entries have been received :—

Reginald Watson Kenworthy and Proprietors of *Yorkshire Evening News*, Leeds.

Particulars of Aircraft : Blackburn Kangaroo, fitted with two Rolls-Royce Falcon engines, 250 h.p. each.

Major A. S. C. Stuart-MacLaren, O.B.E., M.C., A.F.C.

Particulars of Aircraft : Handley Page, fitted with two Napier "Lion" engines, 450 h.p. each.

THE FLYING SERVICES FUND

(*Registered under the War Charities Act*, 1916.)

Administered by the Royal Aero Club.

For the benefit of *Officers, Non-Commissioned Officers and Men* of the ROYAL AIR FORCE who are incapacitated while on duty, and for the widows and dependants of those who are killed or die from injuries or illness contracted while on duty.

Honorary Treasurer :
The Right Hon. LORD KINNAIRD.

Committee :
H.R.H. PRINCE ALBERT, K.G. (*Chairman*).
Lieut.-Col. A. DORE, D.S.O.
Mr. CHESTER FOX.
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H. E. PERRIN, Secretary.

AERIAL MAIL TO HOLLAND

IN the last issue of FLIGHT appeared a notice from the Postmaster-General inviting tenders for the carriage of mails by air to Holland. The terms under which the contracts will be placed are now published below, and in them are conditions which, in the present stage of aviation, are calculated to make firms hesitate to tender for a contract. The period of three years is not reasonable. Rather should it be for one year, with privileges for extension beyond that time. Again the obligations as to delivery and the penalties attached to late delivery are so penal that it would appear as if the Postmaster-General in inviting tenders had at the back of his mind the making of tenders so difficult as to preclude even the chance of a sporting offer :—

1. The Postmaster-General, in conjunction with the Dutch Post Office, is desirous of establishing an air mail service between London and The Hague.

2. The terminal aerodromes will be (1) at Croydon, or such other aerodrome as the Postmaster-General may specify, and (2) near Amsterdam, Rotterdam, or The Hague.

3. It is desirous that the mail from London should reach the Dutch aerodrome by 3 p.m., in which case the Dutch Post Office will arrange for the delivery of express correspondence by special messenger at The Hague, Amsterdam, and Rotterdam between 3 p.m. and 7 p.m. Letters for places beyond those towns will be forwarded by train, and be delivered the same evening or the following morning.

4. The mail from Holland should reach the London aerodrome about 3.30 p.m., and will be delivered by express messenger in London about 5 p.m. Letters for the provinces will connect with the night mails from London for delivery next morning.

5. The Postmaster-General invites tenders for a daily service, Sundays excepted, from London to Holland. It will be desirable that any company tendering should be in a position to arrange for joint working with the company holding the contract from the Dutch Post Office for the service from Holland to London. The company tendering will, however, be solely responsible for the outward service (whether performed by its own aeroplanes or not), which must be carried out notwithstanding any breakdown or a discontinuance of the Dutch service in the reverse direction.

6. Letter mails only (*i.e.*, letters, post-cards, printed papers, commercial papers, and samples, registered or unregistered) will be conveyed. There will be no insured correspondence or parcels.

7. The carriage of passengers and parcels by the contractor will be permitted, provided that the safety of the mails and due performance of the mail service are not thereby interfered with.

8. A formal contract for a period of three years must be entered into; and the Postmaster-General reserves the power to terminate this summarily in the event of bankruptcy, liquidation, etc., or of serious or habitual default. The contract will be prepared by the Postmaster-General, and until its execution there will be no obligation between the parties. The continuance of the service may be contingent on the adhesion of both Great Britain and Holland to the International Air Navigation Convention.

9. No payment will be due to the contractor in cases in which the service is not completed, or in which mails sent by air do not arrive at the terminal aerodrome by 8 p.m. If on any occasion it is impossible to complete the flight, the contractor must arrange at his own expense for the onward transmission of the mails to their destination by the quickest means available.

10. In the event of the loss of registered postal packets, the contractor will refund such sums, not exceeding 50 f. per packet, as are paid as compensation under Post Office regulations.

11. The charge to the public, in addition to the ordinary postage, will be fixed by agreement between the Postmaster-General and the Dutch Post Office, and will be so adjusted as to cover the cost of conveyance by aeroplane, together with a charge of about 6*d.* per letter on letters intended for express delivery.

12. Tenderers are requested to furnish the following particulars :—

(*a*) Name of company tendering, with names of directors and managers.

(*b*) Experience, if any, which the company have had in the organisation and working of a commercial air service.

(*c*) Arrangements for accommodation, repairs, and maintenance in England and in Holland.

(*d*) Type of aeroplane which will be used; engine, speed, carrying capacity, range of flight, etc.; number of aeroplanes available. Provision will be made in the contract for a change in the type of aircraft employed, provided that the prior consent of the Postmaster-General has been obtained.

(*e*) Proposed time of departure from the London aerodrome.

(*f*) Average time of transit, aerodrome to aerodrome, from London to Holland.

(*g*) Earliest date on which service can begin.

(*h*) Rate of payment required per packet or per lb. (i) if conveyance of outward mails from the General Post Office to the aerodrome and of inward mails from the aerodrome to the General Post Office is provided by contractor; (ii) if such conveyance is provided by the Post Office. A tender may specify an alternative basis of payment for consideration if so desired.

13. Tenders should be in the form of letters stating precisely how the proposed service would be carried out, and giving the information indicated in paragraph 12. They should be forwarded in sealed covers addressed to the Secretary, General Post Office, and should be marked outside, "Tender for air mail service." The latest date for acceptance will be May 15, 1920.

Two of the starboard 150 h.p. Sunbeam engines on the Sikorsky biplane

THE AIR MINISTRY COMPETITIONS

THE rules for the Air Ministry competitions for large and small aeroplanes and seaplanes having undergone a considerable amount of revision, in consultation with the Society of British Aircraft Constructors, have now been re-issued, and below we reproduce the new rules. Changes have been made in the system of marking with the object, while retaining the safety attributes, of ensuring an all-round excellence in the winning machines and of preventing the success of machines excelling in one quality only, as, for instance, speed, while providing specifically for reliability and economy in flight.

The competition for large and small aeroplanes will open on August 3, while the competition for amphibians will commence on September 1.

It may be recalled that the prizes which are only open to British subjects and to British-built aircraft and engines, are:—

Small-type aeroplanes
1st, £10,000; 2nd, £4,000; 3rd, £2,000.

Large-type aeroplanes
1st, £20,000; 2nd, £8,000; 3rd, £4,000.

Amphibians
1st, £10,000; 2nd, £4,000; 3rd, £2,000.

The Government reserves the right to vary the proportion of the prizes if the merits of the machines warrant it, or to withhold them, if in the opinion of the Judges' Committee, no real advance on existing designs is shown.

In addition, the Government will, if the entrant agrees, buy the winning machine of each type, the designs to remain the property of the manufacturer. The prices payable will be: Small-type aeroplane, £4,000; large-type aeroplane, £10,000; seaplane, £8,000.

Oil and petrol and accommodation (as far as possible) will be supplied free by the Government.

Entries for the aeroplane competition close on June 1 and for seaplanes on July 1. They must be made on a form to be obtained from the Secretary, C.G.C.A. (C.A.L.) Air Ministry, Kingsway, W.1, and with each entry must be forwarded a deposit of £20, returnable after the competition in the event of the aircraft entered being duly delivered to take part.

Pilots, who must be duly licensed, may be changed with the consent of the Judges' Committee, who shall also have the right to put up a service pilot to fly the machine.

Under certain conditions the competing machines may be repaired or replaced, and airscrews, planes, floats and power units, changed, if the permission in writing of the Judges' Committee is obtained.

CONDITIONS AND TESTS.

AEROPLANES.

1. Competitions will be held, commencing on 3rd August, 1920, for small and large types of aeroplanes with the object of ascertaining the best types of aeroplanes which will be safe, comfortable and economical for air travel.

2. The aeroplanes to be entered will be as follows:—(*a*) Small type with seating accommodation up to six persons (excluding crew). (*b*) Large type with seating accommodation for seven persons or more (excluding crew).

3. Machines and engines must have been designed and constructed within the British Empire. This rule will not, however, apply in the case of such secondary equipment as ignition system, carburettors and instruments, but the use of foreign secondary equipment will be penalised by the deduction of marks (para. 27).

4. Machines are to fulfil all conditions required for a certificate of airworthiness, and must be fitted with the following instruments:—Revolution counter, aneroid, air speed indicator, turn indicator, compass, watch, oil pressure gauge (when necessary), air pressure indicator (when necessary), radiator thermometer (when necessary).

5. Full load for both types of aeroplanes is to include petrol and oil sufficient to fly 450 miles at 3,000 ft. at a speed of not less than 80 m.p.h., and n addition the declared passenger load (including pilot and crew, if any), the standard weight of each person to be taken at 200 lbs.

6. The prescribed tests for the machines are set out in the following paragraphs. Marks will be given or deducted for passing or failing to pass the whole or any part of each test, in accordance with the scales set out below, but no machine will be disqualified for failure to pass the whole or any part of any test except in the case of the conditions and tests laid down in paras. 4, 11 and 14, which must be carried out.

7. Subject to rule 6, each machine should be capable of flying level with full load at or above 100 m.p.h. at ground level, and at or below 45 m.p.h. at ground level. (*Vide* para. 22.)

8. LANDING AND GETTING-OFF TESTS.—(*a*) A circle will be marked out on open ground to represent a field surrounded by obstacles. This circle will be of the following diameter:—Small machines, 175 yds; large machines, 275 yds.

The obstacles may be represented by a continuous string or tape, with streamers attached, 50 ft. from the ground, of such a nature as to be easily broken by an aeroplane. (*b*) The landing should be made in still air. Still air includes any wind not exceeding 5 m.p.h. at ground level. (*c*) During landing the machine is not to side-slip nor to turn, after reaching the obstacles, until it is on the ground. Once it has touched the ground the machine may turn in any direction, provided that it does not leave the ground. (*d*) Marks will be allotted or deducted for machines landing in an area more or less restricted than that specified for this test. (*Vide* para. 23.)

In judging this, the point vertically below the point where the centre line of the machine crosses the obstacle will be marked on the ground and the maximum distance reached by the wheels of the undercarriage will be measured n a straight line from this point. (*e*) After landing, the machine should get out of the same field over the 50-ft. obstacles in still air (as defined in sub-para. (*b*)), no turn to be allowed until clear of the obstacles on the far side. (*Vide* para. 24.) (*f*) No braking device operated by the engine may be used during landing. (*g*) Any landing or taking-off gear used must be integral with the machine. (*h*) No landing apparatus may be used which in the opinion of the Judges' Committee would be liable to cause undue damage to an aerodrome; *e.g.*, a claw attached to the machine, as used on certain types of German machines, would not be allowed, but the ordinary knife-edge on a tail-skid would be allowed. (*j*) Machines will start with full load, and will be allowed to fly for 20 minutes. If they have not carried out their tests by the end of that period, they must land and fill up again. (*k*) Each machine will be allowed two trial attempts (which are definitely to be regarded as such) and thereafter will be allowed four attempts.

9. LANDING AND GETTING-OFF TESTS WITH ONE ENGINE CUT OUT (FOR MULTI-ENGINED AIRCRAFT).—The Judges' Committee will allot marks for ability to carry out the following tests. (*Vide* para. 27):—(*a*) A circle will be marked out on open ground to represent a field surrounded by a normal hedge 6 ft. high. This circle will be of 400 yds. diameter. The hedge may be represented by a continuous string or tape, with streamers attached 6 ft. from the ground, of such a nature as to be easily broken by an aeroplane. (*b*) The landing to be made in still air, with one engine completely cut out. The engine is to be cut out at the height of 2,000 ft. Still air includes any wind not exceeding 5 m.p.h. at ground level. (*c*) The machine should come to a standstill before reaching the marks representing the boundary of the field. (*d*) After landing, the machine, starting from a position of rest, should get out of the same field over the hedge in still air (as defined in sub-para. (*b*)), with one engine completely cut out. (*e*) After clearing the hedge, as in sub-para. (*d*), the cut-out engine, if possible and so desired, may be started up. (*f*) No braking device operated by the engine may be used during landing. (*g*) Any landing or starting-off gear used must be integral with the machine. (*h*) No landing apparatus may be used that, in the opinion of the Judges' Committee, would be liable to cause undue damage to an aerodrome. (*j*) Both landing and starting-off to be with half load, such half load being defined to be half petrol and oil load, as well as half of the declared passenger weight. (*k*) Each machine will be allowed two trial attempts (which are definitely to be regarded as such) and thereafter will be allowed four attempts.

10. RELIABILITY AND ECONOMY TEST.—Each machine should carry out two consecutive flights of 3½ hours each, at a speed through the air of not less than 80 m.p.h., at a height of not less than 3,000 ft. The load carried must not be less than the full load (*vide* para. 5) but may be more, up to the limit allowed by the certificate of airworthiness. Between flights machines will be left untouched, and under seal, if necessary; a period of not more than 60 minutes being allowed before the second flight for the purpose of filling up and normal examination by the competitor. No parts of the machine to be changed without permission from the Judges' Committee. Pilots may be changed during the flights. The Economy Test will be carried out in conjunction with the Reliability Test. Marks will be allotted in accordance with paras. 25 and 26.

11. Machines must be capable of landing from a height of 500 ft., with their engines switched off or completely throttled down.

12. In a machine having two or more engines, the stoppage (or retardation) of any one engine should not prevent the machine from continuing on its flight path without losing height, nor cause it to get out of control. (*Vide* para. 27.)

13. Engines should be capable of being started from the cockpit or cabin without undue muscular exertion on the part of the pilot. (*Vide* para. 18 (*k*).)

14. Machines must be capable of flying at cruising speed for five minutes without the use of any controls or stabilising devices. Controls may be locked during this test.

15. Machines should be capable of standing unattended, and not fastened down in a wind of not less than 10 m.p.h., blowing in any direction with reference to the machine. (*Vide* para. 18 (*o*).)

16. The design of the machine to be such that the machine shows no tendency to turn over on rough ground. (*Vide* para. 18 (*p*).)

17. Each machine to be provided with a complete outfit for pegging it out in the open. This outfit will not be carried as part of the load during tests. (*Vide* para. 18 (*o*).)

18. Marks will be awarded for general features, *i.e.*:—(*a*) Fire protection, including position and construction of tanks (from the point of view of safety from fire in event of a crash); fire-fighting appliances and accessibility of same. (*b*) Reliability of petrol and oil systems, and facilities for seeing quantity in all tanks. (*c*) Reliability of water system and facilities for seeing quantity in all tanks. (*d*) Durability of machine, including airscrew(s) (any advantages due to metal construction may be taken into account). (*e*) Simplicity of design and accessibility of parts, with particular reference to engine installation. (*f*) Effectiveness of Air Controls. (*g*) Lightness of Air Controls. (*h*) Unrestricted field of view to the front for the pilot. (*j*) Comfort generally, including warmth, ventilation, convenient arrangements for the use of instruments and controls, absence of vibration and efficiency (as affecting the passengers and crew) of the arrangements for securing the exclusion of noise. (*k*) Ease of starting engine(s). (*Vide* para. 13.) (*l*) Field of view for passengers. (*m*) Freedom of entry and exit (passengers). (*n*) Freedom of entry and exit (pilot). (*o*) Facilities for pegging out in the open and lightness of apparatus; also ability to stand unattended. (*Vide* paras. 15 and 17.) (*p*) Ease of Taxi-ing, shock absorbing capacities of undercarriage, and prevention of somersaulting. (*Vide* para. 16.)

19. The Judges' Committee may have regard to the method of fitting parachutes, and especially to the means of exit by parachute afforded to the occupants of the large machine, but the provision of parachutes will be optional.

20. Marks will not be given on account of the number of engines installed.

Allocation of Marks.

21. For *both* classes the allocation of marks will be in the following proportions:—

(A) Speed, 20 per cent.; (B) Landing, 12 per cent.; (C) Getting off, 8 per cent.; (D) Reliability in flight, 10 per cent.; (E) Economy, 15 per cent.; (F) General Features, 35 per cent. Total 100 per cent.

In each section the machine obtaining the highest number of marks in that section will be awarded the full percentage of marks obtainable. The percentage obtained by other machines will be graded in proportion to the number of marks gained by them as compared with that of the machine gaining the highest number of marks.

In no section will any machine be awarded negative (*i.e.*, less than zero) marks.

22. (A) SPEED (para. 7). Maximum marks allocated, 20 per cent.

High Speed.—For each m.p.h. above required standard, 1 awarded. For each m.p.h. below required standard, 1 forfeited.

Low Speed.—For each m.p.h. below required standard, 2 awarded. For each m.p.h. above required standard, 2 forfeited.

23. (B) LANDING (para. 8). Maximum marks allocated, 12 per cent.

For every complete 3 yds. less than the distance allowed, *i.e.*, 175 yds. for small and 275 yds. for large machines, 1 awarded. For every complete 3 yds. more than the distance allowed, 1 forfeited.

24. (C) GETTING OFF (para. 8). Maximum marks allocated, 8 per cent. For every complete foot by which machine clears 50 ft. barrier, 1 awarded. For every complete foot below 50 ft. barrier, 1 forfeited.

25. (D) RELIABILITY IN FLIGHT (para. 10). Maximum marks allocated, 10 per cent.

If first attempt of complete test is successful, 10 awarded. If second attempt successful, 6 awarded. If third attempt successful, 2 awarded. For each change of parts between flights, ½ forfeited. For every complete five minutes in excess of the 60 minutes allowed between flights, 1 awarded.

26. (E) ECONOMY (para. 10). The following equation will be employed :—

$\frac{W}{G}$ = number awarded. Maximum Marks Allocated—15 per cent.

Where :—W = Useful load in lbs., including weight of passengers carried (or the dead weight in lieu); but not including the weight of pilot or crew, or petrol and oil. G = Gallons of petrol and oil used in the reliability test.

27. (F) GENERAL FEATURES (para. 18). Maximum marks allocated, 35 per cent.

Marks awarded sub-para. (*a*) 13, (*b*) 9, (*c*) 6, (*d*) 9, (*e*) 9, (*f*) 9, (*g*) 5, (*h*) 9, (*j*) 13, (*k*) 10, (*l*) 5, (*m*) 4, (*n*) 2, (*o*) 4, (*p*) 9.

For Multi-Engine Machines (paras. 9 and 12).

For ability to get over 6 ft. hedge with half load, when one engine is cut out, 10 awarded. For ability to fly level and remain fully controllable with full load when one engine is cut out, 14 awarded.

(The numbers given show the highest award obtainable under each heading, and may not be awarded in full to any machine if, in the Judges' opinion, a sufficiently high standard is not attained. The maximum marks (35 per cent.) will be allocated to the highest total obtained in this way.

Machines having air-cooled engines will automatically be allotted the 6 specified above for Reliability of Water System (sub-para. (*c*)).

Use of Foreign Secondary Equipment (para. 3). For each item, 2 forfeited.

SEAPLANES (AMPHIBIANS)

1. A competition will be held, commencing on 1st September, 1920, with the object of ascertaining the best types of Float Seaplanes or Boat Seaplanes which will be safe, comfortable and economical for air travel, and be capable of alighting on and rising from land as well as water.

2. Each machine entered for the competition will be provided with seating accommodation for a minimum of two persons, exclusive of the crew.

3. Machines and engines must have been designed and constructed within the British Empire. This rule will not apply in the case of such secondary equipment as ignition system, carburettors and instruments, but the use of foreign secondary equipment will be penalised by the deduction of marks (para. 29).

4. Machines are to fulfil all conditions required for a certificate of airworthiness, and to carry life-belts for all persons for whom accommodation is provided, including the crew. Machines must also be fitted with the following instruments :—Rev. counter, aneroid, air speed indicator, compass, watch, turn indicator, bearing plate, sextant, oil pressure gauge (when necessary), air pressure gauge (when necessary) radiator thermometer (when necessary). With the machine fully loaded, the boat or floats must be such that, if perforated in any one part, the boat or each float still retains positive buoyancy.

5. Full load is to include :—Petrol and oil sufficient to fly 350 nautical miles at 1,000 ft. at a speed of not less than 70 knots. In addition, a load of 500 lb. to include passengers, if carried, and lifebelts, but not including crew or any gear specified in paras. 10 (*a*) and 15. The standard weight of each passenger to be taken as 200 lb.

6. The prescribed tests for the machines are set out in the following paragraphs. Marks will be given or deducted for passing or failing to pass the whole or any part of each test, in accordance with the scales set out below, but no machine will be disqualified for failure to pass the whole or any part of any test except in the case of the conditions and tests laid down in paras. 4 and 17, which must be carried out.

7. Subject to rule 6, each machine should be capable of flying level at, or above, a speed of 80 knots with full load at sea level, and should also be capable of flying level at, or below, a speed of 40 knots with full load at sea level.

8. ALIGHTING AND GETTING-OFF TESTS.—(*a*) *Getting-Off Test* (*Sea*).—Machines will be required to take off a smooth sea with full load and clear an obstacle 25 ft. above sea level in a distance not exceeding 600 yds. from a position of rest. On conclusion of each attempt that counts as a test, machines will alight on the aerodrome. (*Vide* para. 26.) (*b*) *Alighting Test* (*Land*).—Machines will be required to land on an aerodrome over an obstacle 25 ft. in height, and should come to rest in a distance not exceeding 400 yds., measured in a straight line from the point where the obstacle is crossed. For this test machines will be required to carry full load less 50 per cent. total fuel and oil, and will be allowed to fly for 20 minutes. If they have not carried out the test by the end of that period they must alight and fill up again. Marks will be allotted or deducted for machines landing in an area more or less restricted than that specified for this test. (*Vide* para. 25.) In judging this, the point vertically below the point where the centre line of the machine crosses the obstacle will be marked on the ground and the maximum distance reached by the wheels of the undercarriage will be measured in a straight line from this point. (*c*) *Getting-Off Test* (*Land*).—Machines will be required to take off from an aerodrome with full load and clear an obstacle 25 ft. in height in a distance not exceeding 400 yds. from a position o' rest. (*Vide* para. 26.) On conclusion of each attempt that counts as a test, machines will alight on the sea. (*d*) The above tests should be made in still air, which, for the purposes of this competition, will be regarded as any wind velocity not exceeding five statute m.p.h. (*e*) During landing the machine is not to side-slip, nor to turn after reaching the obstacle until it is on the ground. Once it has touched the ground the machine may turn in any direction, provided that it does not leave the ground. (*f*) No braking device operated by the engine may be used during landing. (*g*) Any landing or taking-off gear used must be integral with the machine. (*h*) No landing apparatus may be used which in the opinion of the Judges' Committee would be liable to cause undue damage to an aerodrome, *e.g.*, a claw attached to the machine, as used on certain types of German machines, would not be allowed, but the ordinary knife-edge on a tail-skid would be allowed. (*j*) In each of tests (*a*), (*b*) and (*c*) above, machines will be allowed two trial attempts, which are definitely to be regarded as such, and thereafter will be allowed four attempts.

9. RELIABILITY AND ECONOMY TEST.—Each machine should carry out a flight of three and a half hours' duration at a speed through the air of not less than 70 knots, at a height of not less than 1,000 ft. The load carried should not be less than the full load (*vide* para. 5) but may be more, up to the limit allowed by the certificate of airworthiness. Pilots may be changed during this flight. The Economy Test will be carried out in conjunction with the Reliability Test. Marks will be allotted in accordance with paras. 27 and 28.

10. MOORING-OUT TESTS. (*Vide* para. 30.) (*a*) *Fair Weather.*—Each machine will be moored to a buoy by its own crew, using its own mooring tackle (other than the buoy and its moorings), for a period of 24 hours, during which time it will be left unattended. The crew will not be allowed on board to pump out the bilges at any time during this test except with the permission of the Judges' Committee in case of emergency. At the conclusion of the 24 hours' period the crew will be allowed on board. and the machine will be got under way by its own crew and under its own power, and will be required to carry out a short flying test within a period of one hour from the conclusion of the 24 hours' period. The test will be carried out under fair weather conditions

(*b*) *Moderate Weather.*—Each machine will be moored to a buoy for a period of not less than 12 hours, unattended, under the following conditions :—Locality—Roadstead sheltered from the open sea. Wind—From four to six on the Beaufort Scale. In both the above tests the ordinary average tidal currents existing round the coast of the British Isles may be experienced.

11. Each machine will be required to carry out a test of getting-off and alighting on disturbed water, which in the opinion of the Judges' Committee, constitutes a moderate sea. The condition in any case will not exceed State 4 in the sea-disturbance scale—(waves under 4 ft. in height). (*Vide* para. 30.)

12. Machines will be required to carry out a test of being towed in a moderate sea as defined in para. 10, in a circle of approximately half-mile radius. (*Vide* para. 30.) The tests specified in paras. 11 and 12 will be the last tests to be carried out.

13. Each machine should be capable of moving on the water, under its own power, for a period of at least 30 minutes and at a speed of not less than 10 knots, and not greater than 20 knots. (*Vide* para. 30.)

14. Each machine must make a figure-of-eight course on the water under its own power round two buoys 100 yds. apart and within a rectangle measuring 200 yds. by 100 yds., in a wind not exceeding 15 m.p.h., the sea to be smooth and the tide at slackwater. (*Vide* para. 30.)

15. Each machine will be required to carry an anchor and sea anchor, as well as its own mooring tackle, and to anchor on good holding ground with its own gear and remain fast in a wind of not less than 10 m.p.h., and with tidal current not exceeding three knots, and to carry out the same test for picking up and slipping a mooring. (*Vide* para. 30.)

16. In a machine having two or more engines, the stoppage (or retardation) of one engine should not cause the machine to get out of control. (*Vide* para. 29.)

17. Machines must be capable of flying at cruising speeds for three minutes without the use of any control or stabilising devices. Controls may be locked during the test.

18. Engines should be capable of being started from the cockpit or cabin, without undue muscular exertion. (*Vide* para. 20 (*k*).)

19. The machine to be flown level at full speed (or partly throttled, should the Competitor so desire). The engines are then to be cut out and the machine should take up and maintain a gliding angle without the use of any stabilising devices and without any of the controls other than the rudder being used. Marks will be awarded in accordance with para. 29.

20. Marks will be awarded for general features,, *i.e.* :—(*a*) Fire protection including position and construction of tanks (from the point of view of safety from fire in event of a crash); fire-fighting appliances and accessibility of same. (*b*) Reliability of petrol and oil systems, and facilities for seeing quantity in all tanks. (*c*) Reliability of water system, and facilities for seeing quantities in all tanks. (*d*) Durability of machine, including airscrew(s) (any advantages due to metal construction may be taken into account). (*e*) Simplicity of design and accessibility of parts, with particular reference to engine installation. (*f*) Effectiveness of air controls. (*g*) Lightness of air controls. (*h*) Unrestricted field of view to the front for the pilot. (*j*) Comfort generally, including warmth, ventilation, convenient arrangements for the use of instruments and controls, absence of vibration, and efficiency (as affecting the passengers and crew) of the arrangements for securing the exclusion of noise. (*k*) Ease of starting engine(s). (*Vide* para. 18.). (*l*) Field of view for passengers. (*m*) Freedom of entry and exit (passengers). (*n*) Freedom of entry and exit (pilot). (*o*) Convenience of mooring and anchoring arrangements. (*p*) Bilge-pumping arrangements. (*q*) Ease of repair, especially in regard to the hull or floats.

21. Marks will be awarded (*vide* para. 30) for behaviour afloat, *i.e.* :—(*a*) Stability at rest. (*b*) Water stability at all speeds. (*c*) Minimum spray at all speeds.

22. Marks will not be given on account of the number of engines installed.

Allocation of Marks.

23. The allocation of marks will be in the following proportions :—

(A) Speed, 20 per cent.; (B) Landing, 10 per cent.; (C) Getting off, 10 per cent.; (D) Reliability in Flight, 10 per cent.; (E) Economy, 15 per cent.; (F) General Features, 20 per cent.; (G) Seaworthiness, 15 per cent. Total, 100 per cent.

In each Section the machine obtaining the highest number of marks in that Section will be awarded the full percentage of marks obtainable. The percentages obtained by other machines will be graded in proportion to the number of marks gained by them as compared with that of the machine gaining the highest number of marks. In no section will any machine be awarded negative (*i.e.*, less than zero) marks.

24. (A) SPEED (para. 7). Maximum marks allocated, 20 per cent.

High Speed.—For each knot above required standard, 1 awarded. For each knot below required standard, 1 forfeited.

Low Speed.—For each knot below required standard, 2 awarded. For each knot above required standard, 2 forfeited.

25. (B) LANDING (para. 8). Maximum marks allocated, 10 per cent.

For every complete 3 yds. less than 400 yds., 1 awarded. For every complete yard more than 400 yds., 1 forfeited.

26. (C) GETTING OFF (para. 8). Maximum marks allocated, 10 per cent.

For every complete foot by which machine clears 25 ft. barrier (sea test), 1 awarded. Ditto (land test), 1 awarded. For every complete foot below 25 ft. (sea test), 1 forfeited. Ditto (land test), 1 forfeited.

27. (D) RELIABILITY IN FLIGHT (para. 9). Maximum marks allocated, 10 per cent.

If first attempt successful, 10 awarded. If second attempt successful, 6 awarded. If third attempt successful, 2 awarded.

28. (E) ECONOMY (para. 9). The following equation will be employed :—

$\frac{W}{G}$ = No. of Marks. Maximum Marks Allocated—15 per cent.

Where :—W = Useful load in lbs., including weight of passengers carried (or of the deadweight in lieu), but not including the weight of pilot or crew or petrol and oil. G = Gallons of petrol and oil used in the reliability test.

29. (F) GENERAL FEATURES (para. 20). Maximum marks allocated, 20 per cent.

Marks awarded, sub-paras. (*a*) 6, (*b*) 2, (*c*) 2, (*d*) 6, (*e*) 8, (*f*) 4, (*g*) 2, (*h*) 6, (*j*) 16, (*k*) 6, (*l*) 2, (*m*) 4, (*n*) 2, (*o*) 8, (*p*) 2, (*q*) 4.

For Multi-Engine Machines (para. 16). For ability to remain fully controllable when one engine is cut out, 4 awarded. For ability to take up and maintain gliding angle (para. 19), 4 awarded.

(The numbers given show the highest award obtainable under each heading, and may not be awarded in full to any machine if in the Judges' opinion a sufficiently high standard is not attained. The maximum marks (20 per cent.) will be allocated to the highest total obtained in this way. Machines having air-cooled engines will automatically be allotted the 2 specified above for Reliability of Water System—sub-para. (*c*)).

Use of Foreign Secondary Equipment (para. 3). For each item, 2 forfeited.

30. (G) SEAWORTHINESS. Maximum marks allocated, 15 per cent.

Getting off and alighting (rough water) (para. 11), 12 awarded. Mooring out (para. 10), 8 awarded. Towing, taxi-ing and figure-of-eight taxi-ing (paras. 12, 13 and 14), 10 awarded. Anchoring and mooring (para. 15), 7 awarded. Behaviour afloat (para. 21), 5 awarded.

ROYAL AERONAUTICAL SOCIETY NOTICES

Lectures.—The next meeting will take place at the Royal Society of Arts, John Street, Adelphi, at 8 p.m. on Wednesday evening, April 28, when Maj.-Gen. Sir Sefton Brancker will read a paper on "Aerial Transport from the Business Point of View." Maj.-Gen. Sir F. H. Sykes, G.B.E., Controller-General of Civil Aviation, will take the chair.

The Scottish Branch have arranged for the delivery of the following courses of lectures on aeronautics :—

May 3, 4 and 5.—Col. Bristow on "Engines," in Glasgow University.

May 10 and 11.—Squadron-Leader H. E. Wimperis on "Navigation and Meteorology," in Glasgow University.

These lectures will be repeated in Edinburgh and Dundee on subsequent days.

Col. the Hon. the Master of Sempill is also to give a series of lectures, the dates of which are not yet fixed, on "Aircraft," in the same places.

It is announced with regret that Lord Montagu of Beaulieu has found it necessary to postpone his paper on "The Cost of Air-Ton Miles Compared with other Forms of Transport," until the autumn session.

Donations.—The Council desire gratefully to acknowledge the gift of a copy of "The Chemistry and Manufacture of Hydrogen," by Squadron-Leader P. Litherland Teed, R.A.F., from the author.

Council.—The full list of Members of Council for the current year is as follows :—

Air-Commodore R. K. Bagnall-Wild, C.M.G., C.B.E. (Chairman) ; Maj.-Gen. Sir R. M. Ruck, K.B.E., C.B., C.M.G. (Vice-Chairman) ; A. E. Berriman ; F. H. Bramwell ; Air-Commodore H. R. M. Brooke-Popham, C.B., C.M.G., D.S.O., A.F.C. ; Lieut.-Col. A. H. Burgoyne, M.P. ; Wing-Comdr. T. R. Cave-Browne-Cave, C.B.E. ; Sir Mackenzie D. Chalmers, K.C.B., C.S.I. ; Sir Robert Hadfield, F.R.S., Bart. ; Prof. B. Melvill Jones ; Maj. A. R. Low ; Lieut.-Col. M. O'Gorman, C.B. ; A. Ogilvie, C.B.E. ; F. Handley Page, C.B.E. ; A. J. Sutton Pippard ; A. V. Roe ; Lieut.-Col. H. T. Tizard, A.F.C. ; G. Holt Thomas ; Brig.-Gen. J. G. Weir, C.M.G., C.B.E. ; Maj. H. E. Wimperis, O.B.E.

W. LOCKWOOD MARSH,
Secretary.

THE INSTITUTE OF AERONAUTICAL ENGINEERS

Council Meeting.—A meeting of the Council was held on April 12.

Elections.—Honours Diploma : H. P. Folland, M.B.E., Maj. C. C. Turner.

Associate Member : Maj. Lee K. Murray.

Associates : L. A. Wingfield, M.C., D.F.C. ; John Sykes, A.M.I.E.E. ; K. R. Hudson ; W. H. Egelstaff ; W. F. Garner.

Examinations.—The half-yearly examinations of the Institute will be held next month. The latest date for entry was March 31 last, but late entries for the Intermediate Examination, Class A, for Associate Membership, can still be made.

The Special Committee formed to draft the Rules of Examination for admission to the pilots' grade of membership has made its report, which has been adopted.

Offices.—The Secretary will be glad to hear from any members who know of any suitable vacant office accommodation in London.

Lectures.—Members desirous of reading papers are invited to submit three copies each of their lectures to the Council for early consideration.

Donations.—The Council desire to express their thanks to Mr. H. P. Folland for the gift of lantern slides and to Mr. G. Spit for a copy of the work, "Van Vliegen en Vliegtuigen" ("On Flying and Flying Machines"), of which he is a co-author.

Obituary.—It is with deep regret that the Council records the death of Mr. W. H. Lyne, a Founder Member of the Institute, and an early pioneer of gliding flight. Mr. Lyne had not reached the age of 30 when he died, and a special subscription list has been opened by the Council for the benefit of the widow.

DOUGLAS SHAW,
Secretary.

CORRESPONDENCE

[*The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.*]

A FOKKER COLLAPSE AND PARACHUTES

[2015] I was very interested to see Mr. Holt's letter in your issue of April 15, referring to your previous photos. of a crashed Fokker, and the possibilities of the pilot's escape by parachute.

As an eye-witness might I venture to give some details of the accident ?

The catastrophe happened just as the machine was commencing a roll, the top plane lifted quite clear of the *fuselage*, and, as far as it was possible to see, there was nothing to prevent either a "free" or an "anchored" parachute from functioning ; the machine then took up steady dive at an angle of about 45°, and there would have been, comparatively speaking, plenty of time for the pilot to act.

It was not until the machine was about 250 ft. up that one of the lower planes collapsed, and, in the half-roll which followed, wrapt itself round the *fuselage* in such a way as to entirely prevent an "anchored" parachute from acting, had there been one.

If this wing had broken away in that manner at first, only a "free" type of parachute would have saved the unfortunate pilot's life.

C.

THE R.A.F. MEMORIAL FUND

ELSEWHERE in this issue will be found an appeal in connection with the Fund of which H.R.H. Prince Albert is President, which has been established on the initiative of Air-Marshal Sir Hugh Trenchard, Bt., K.C.B., D.S.O., to commemorate the services of the Royal Naval Air Service, Royal Flying Corps, the Australian Flying Corps, and the Royal Air Force, during the War, by an organisation which will secure such lasting benefits to the officers and men of the Royal Air Force and their dependents, as may be worthy of the greatness of the achievements commemorated. The Fund is working in the closest co-operation with the United Services' Fund and with Lord Haig's Committee.

As was indicated in our issue of January 22 last, the objects the Executive Committee have decided to pursue are :—

The erection of a commemorative monument to the fame of the officers and men of the Royal Naval Air Service, the Royal Flying Corps, the Australian Flying Corps, and the Royal Air Force, including the officers and men who joined the Force from the Overseas Dominions.

The stablishment of places of residential education (like the Trafalgar Homes) for the children of airmen.

The provision of bursaries available at approved schools for the children of officers.

Generally the provision of such treatment and the rendering of such assistance, as means may permit, either directly or in co-operation with other organisations, to officers and men and their dependents who may be disabled, sick or otherwise infirm.

All officers and men of the Flying Services, whether from the Dominions or from the United Kingdom, will, of course, be equally eligible for these benefits.

Officers and other ranks of the W.R.A.F. will be eligible for participation in the benefits of the Fund.

Subscriptions should be sent to the Hon. Treasurer at 25, Victoria Street, S.W. 1.

THE AERODYNAMIC PROPERTIES OF THICK AEROFOILS SUITABLE FOR INTERNAL BRACING

BY F. H. NORTON

Curiously enough, just after publishing the article by "Marco Polo" on the cantilever wing, we have received from the U.S.A. Printing Office Report No. 75 of the American National Advisory Committee for Aeronautics, printed below, which deals with this interesting subject. As mentioned by "Marco Polo" in his article, up to the time of writing our own authorities have not thought it of sufficient interest to have carried out experiments on thick wing sections in any of the Government wind tunnels. The subject is, however, one of the very greatest interest, and it is therefore with considerable satisfaction that we have received this proof of American far-sightedness in a matter upon which our own experimenters have shown a singular lack of interest.

"Marco Polo" in his article came to the conclusion that the thick wing, especially the thick tapered wing, is not necessarily so inefficient as is generally thought, and that, as far as the particular type of wing suggested by him is concerned, for certain angles it actually has a somewhat lower resistance than the standard braced wing of the same maximum lift. The American Report states that it has been calculated that section No. 53 fitted in place of R.A.F. 6 would give an increase in speed from 122 m.p.h. to 140 m.p.h. This is even better than estimated by "Marco Polo," who, however, stated in his article that he felt certain that better results could be obtained by other combinations of sections.

Section No. 53 is a straight taper wing of constant chord, whereas that suggested by "Marco Polo" was tapered both in camber and chord. Of the latter type some were tested in America, and the results of that known as No. 48 tally very well with the "Marco Polo" wing, both as regards maximum lift and L/D (when corrected for scale). The American results are stated in lbs./sq. ft. and m.p.h. units, so that the absolute lift coefficient is found by dividing the American lift coefficient by .0051.

The general conclusions stated in the accompanying report bear out very well those arrived at by our correspondent "Marco Polo," and we are in thorough agreement with Mr. F. H. Norton when he says: "By tapering the wing both in plan form and thickness it should be possible to construct a wing which has an h/c ratio in the centre (mean chord) of 0.270 and aerodynamic properties comparing quite favourably with the thin sections used now. This thickness would make possible the use of 14-in. spars on a 5-ft. mean chord. A tapered wing has the advantage of having the greater part of the lift on the portion of the wing close to the body, due to both the greater area and to higher lift sections at this part of the wing, thus decreasing the bending moment in the spars."

We would strongly urge our own authorities to give instructions to have a series of such wings tested at Teddington.—ED.

Introduction.

The object of this investigation is the determination of the characteristics of various types of wings having sufficient depth to entirely enclose the wing bracing, and also to provide data for the further design of such sections. This type of wing is of interest—first, because it eliminates the resistance of the interplane bracing, a portion of the airplane that sometimes absorbs one-quarter of the total power required to fly; second, because it simplifies the construction and assembly of the wing structure, and, third, because these wings may be made to give a very high maximum lift. At the present time, thick internally braced sections are used with considerable success on several German machines, notably the Fokker and Junker biplanes. This type of wing was not original with the Germans, however, for an Antoinette monoplane was built and flown in France about 1910, which was entirely braced from inside the wing section. This wing was flat-bottomed and had a maximum *h/c* ratio of one-sixth.

It was intended to investigate the following subjects :—

1. Effect of changing the upper and lower camber of thick aerofoils of uniform section.
2. Effect of thickening the centre and thinning the tips of a thin aerofoil.
3. Effect of adding a convex lower surface to a tapered section.
4. Effect of changing the mean thickness with constant centre and tip sections.
5. Effect of varying the chord along the span.
6. Effect of varying the thickness and chord in a more complex manner.

The last subject is not yet completed, and will be treated later.

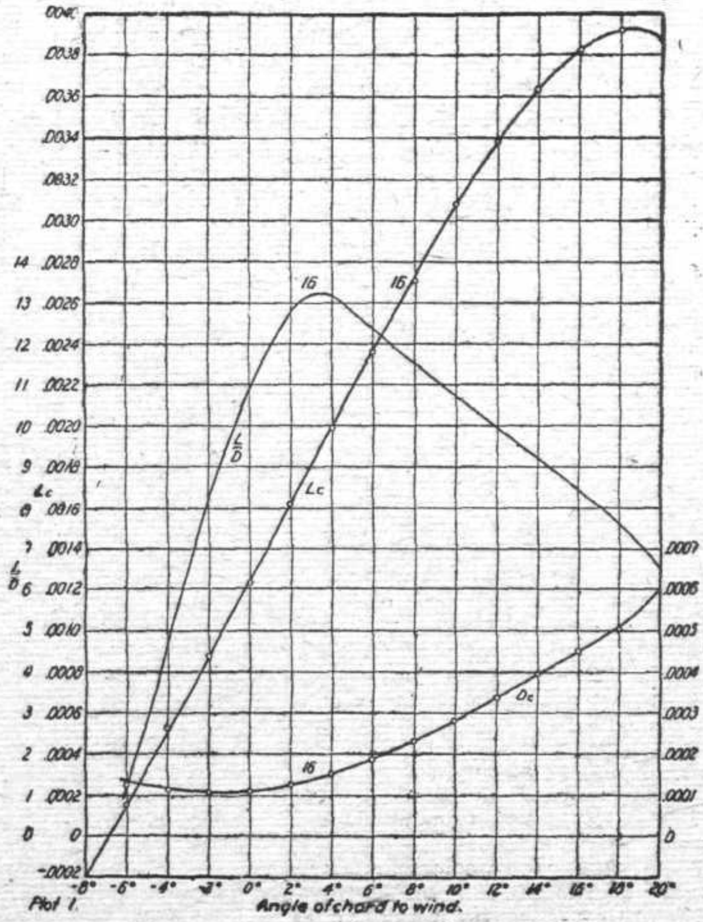
All the sections in this test, unless otherwise stated, are square-ended 3 by 18 in. models, tested with an end spindle at 30 m.p.h., and are comparable with the tests of the U.S.A. sections. Lc and Dc are in lbs. per sq. ft. and m.p.h. units, and the centre of pressure is given in fractions of the chord from the leading edge. The results have a precision of about 1 per cent.

Thick Constant Section Wings

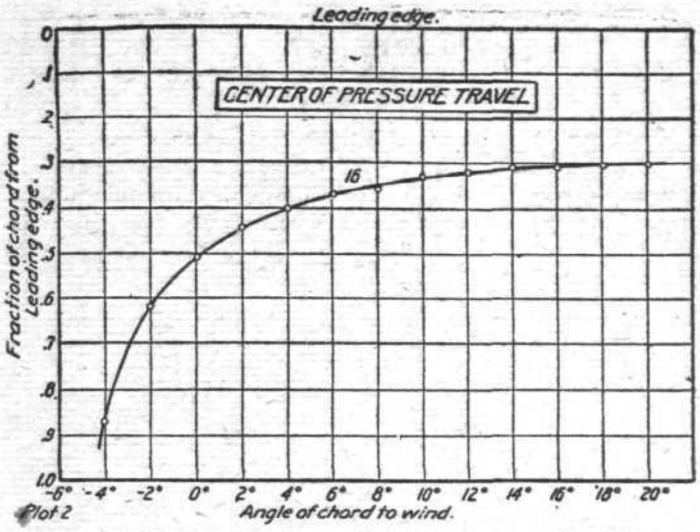
The Durand 13 section gave such an unusually high maximum lift that some slight changes were made in the upper camber to determine its best form and height. The surfaces were made of wax, scraped to size as described in report No. 74. As some of these sections were tested by students and the ordinates were not as accurately produced as in the later sections, the results of the runs are not plotted here. (See the bulletin of the Experimental Department Airplane Engineering Division, December, 1918.) They are sufficiently precise, however, to warrant general conclusions. Except for the higher and more stable maximum lift, these sections gave results that are in agreement with the N.P.L. tests on varying the upper and lower camber.

On thick sections the maximum ordinate must be kept closely to one-third of the chord from the leading edge. Moving it farther back gives a flatter, but lower burble point, while moving it forward gives a lower and very unstable lift curve. With the maximum ordinate one-third of the chord from the leading edge and a section similar to the Durand 13, the highest maximum lift is reached when the greatest thickness is about 0·477 in. on a 3-in. chord. Beyond this height, the lift curve is unstable and decreases with increase in camber. A section was tried with a thin trailing edge, but there was no improvement, and the lift curve had a very bad break in it. The Durand 13 section was also tested with a Constantin type of leading edge. The lift increased rapidly to about 10°, then slowly to about 30°. The maximum Lc and the maximum L/D were not improved, however, with this change. It seems evident that the best upper camber has a maximum height of about 0·477 in. on a 3-in. chord, one-third of the way from the leading edge, giving a maximum Lc of about 0·00400 and a maximum L/D of 13.

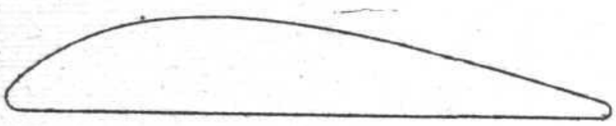
The lower surface has less effect on the aerofoil than the



Plot 1.



upper. As this surface is made more convex the lift and the drag decrease until a minimum drag is reached when the section is symmetrical. The minimum drag also moves to lower angles as the lower surface is made more convex. The maximum L/D is not affected by small changes in the lower surface, but the L/D at low angles is improved by a small convex camber. One section with a concave lower surface

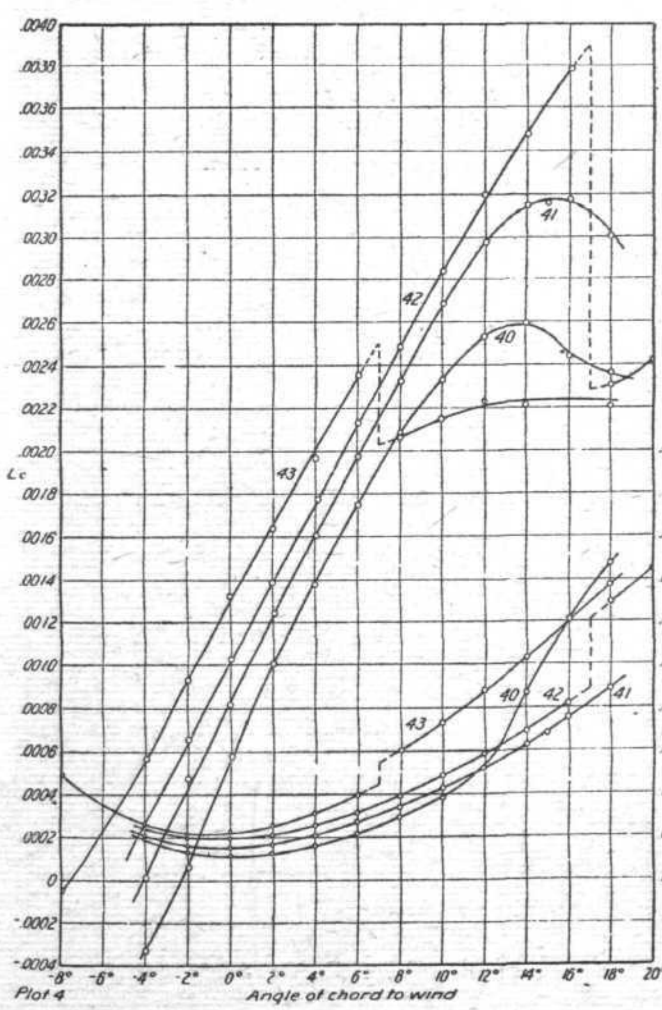


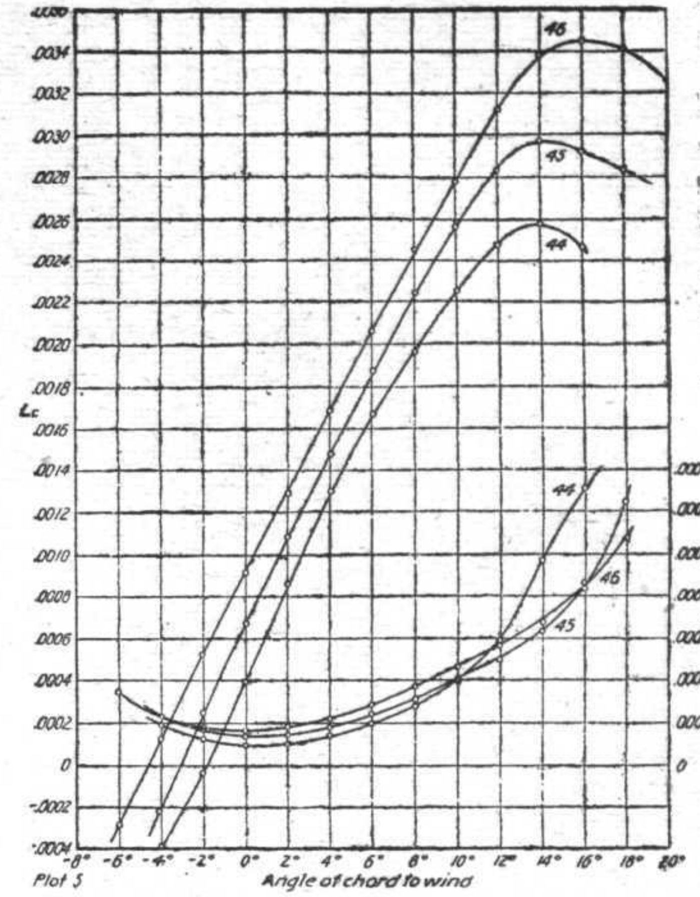
MASTER SECTION

Fig. 3

was interesting, in that it showed a positive, but unstable, lift at -40° incidence. Its maximum value for Lc was 0·00422. Several other irregular lower surfaces were tried, but showed no great improvement over the flat lower surface.

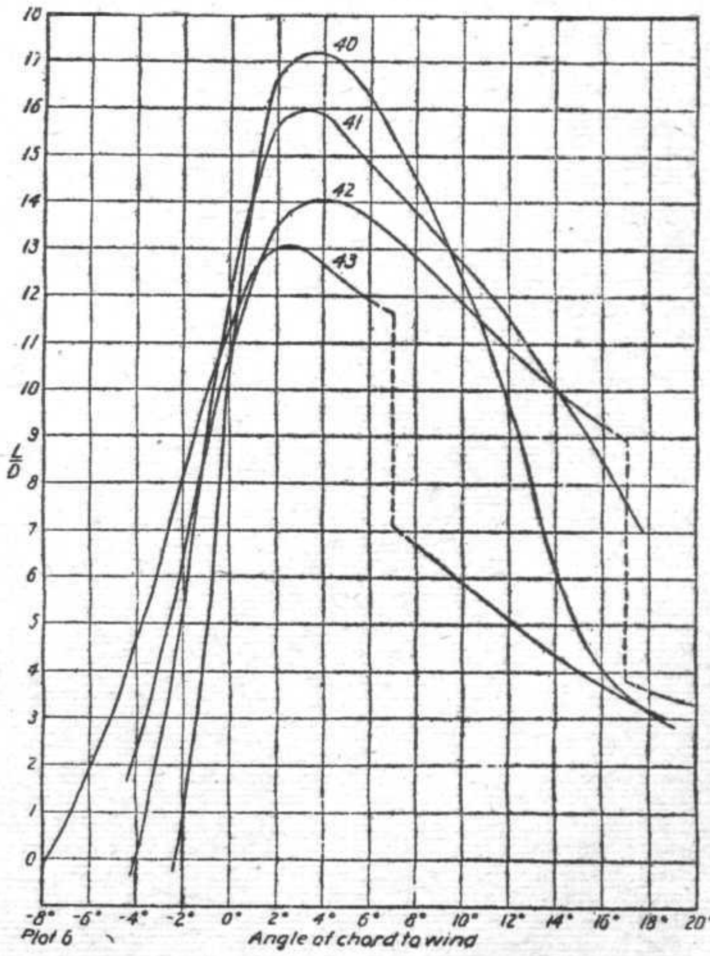
The best flat-bottomed section (used as the master section, Fig. 3) seems to be No. 16, which has an h/c ratio of 0·158, a maximum Lc of (0·00392), and a maximum L/D of (13·1).

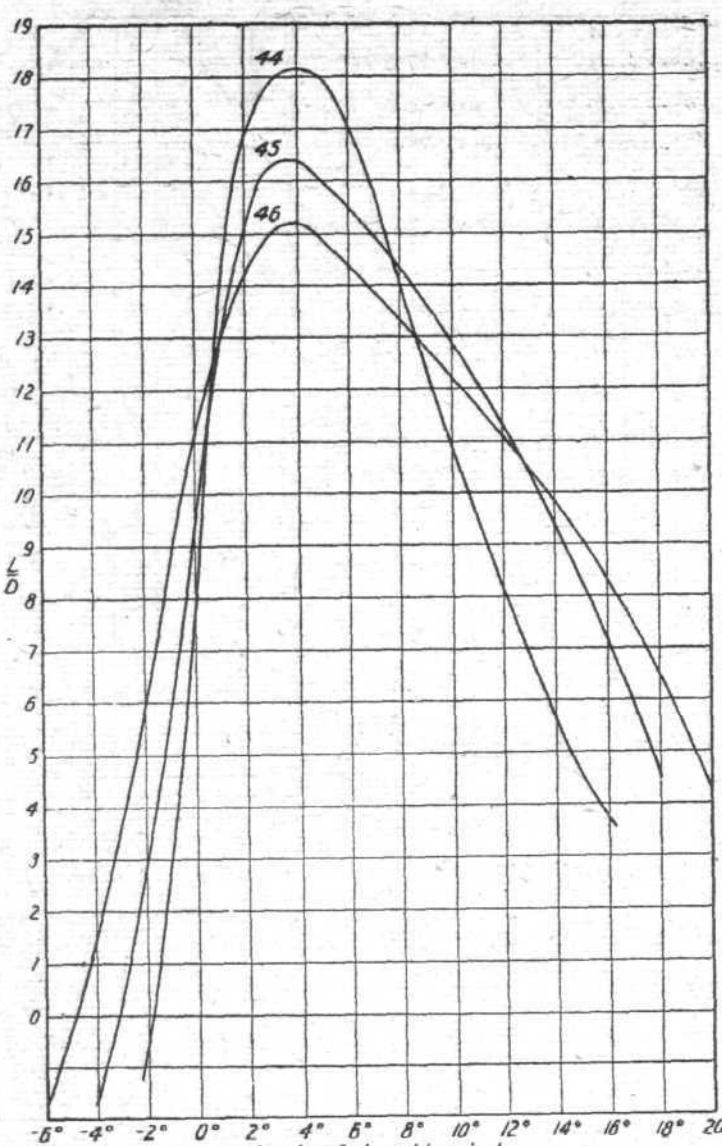




The lift, drag, and L/D for this section are plotted on Plot 1 and the C/P. movement on Plot 2. To illustrate the decrease in wing area allowed by using this wing section, we may take as an example a high-powered machine weighing 4,000 lbs., and having a wing area (R.A.F. 15 section) of 450 sq. ft., a loading of about 9 lbs. per sq. ft. To have the same landing speed an area of 300 sq. ft. would be sufficient with the No. 16 section.

These wings of deep constant section are satisfactory in



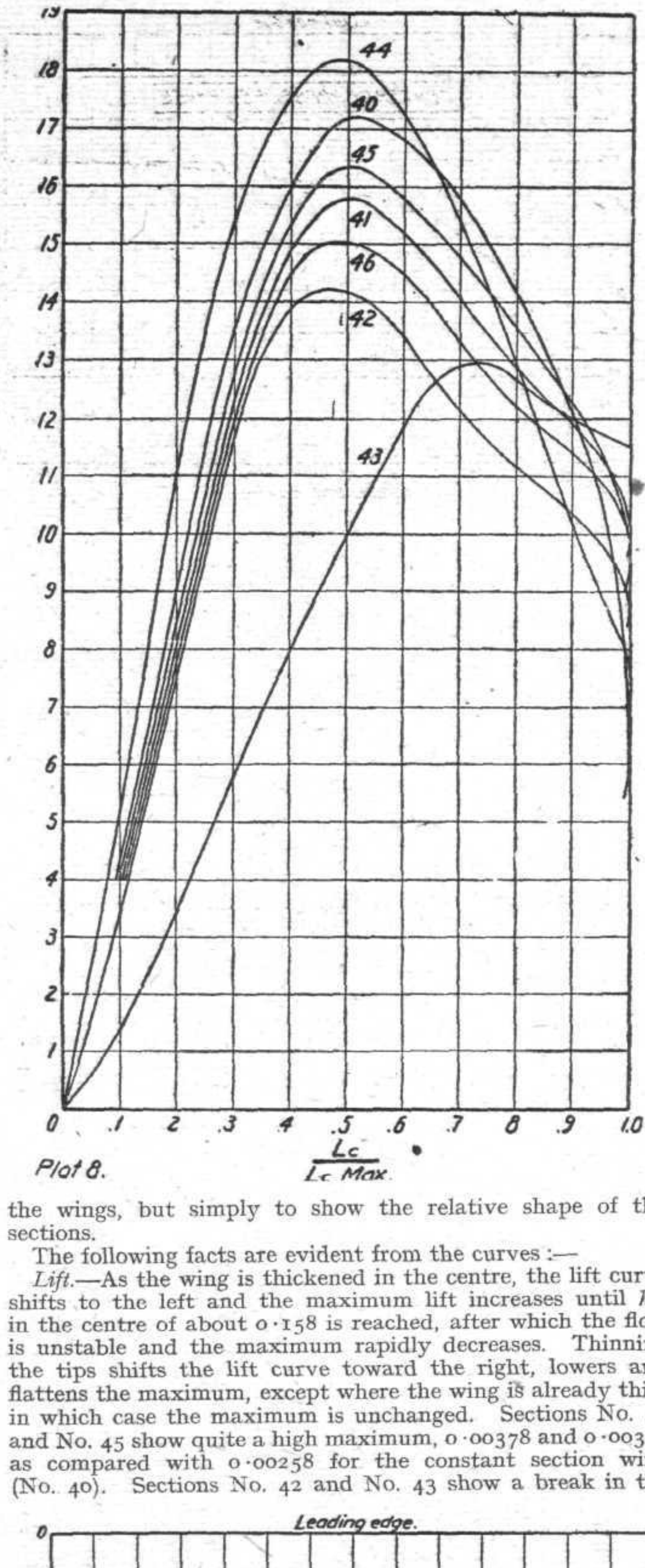


Plot 7.

respect to spar room amd maximum lift, but the L/D is about 20 per cent. lower than for the wings used at present.

The Effect of Thickening the Centre of a Thin Wing

The object of this test is to determine the effects of thickening the centre of the span, and thinning the tips, of a standard type of section. All sections through these wings, perpendicular to the leading edge, are similar to a master section, a modified Durand 13 (Fig. 3). All ordinates were obtained by reducing from the corresponding ordinate of the master section in the same proportion as the maximum ordinate is reduced by a smooth curve from the centre to the tip of the wing. This curve is nearly parabolic with its vertex at the centre of the span. All sections were made flat-bottomed for ease in cutting. There are two series, No. 40–No. 43, where the section at the tip has a chord to depth ratio 13, and the centre of the span is thickened successively, and No. 44–No. 46 where the tip has a chord to depth ration of 25 and the centre is successively thickened in the same way except that the deepest section is omitted because of its obvious unsuitability as shown by No. 43. The centre of the pressure travel was not plotted for sections No. 44–No. 46 because it was thought that nothing of interest would be shown. The models were constructed of maple, 3 by 18 ins. and were within 0·005 in. of the ordinates given in the following tables. Lc and Dc (Plots 4 and 5) and L/D (Plots 6 and 7) are plotted against angle of incidence for each case. Where the curve was discontinued, a sharp break was made, as a fairer representation than a smooth curve. On Plot 8 the L/D is also plotted against $\frac{\text{Lc}}{\text{Lc max.}}$ as giving most readily the comparative merits of the various sections. A fast machine must fly at two or three times its minimum speed, so that a high speed wing must have a high L/D at one-fourth to one-ninth of the maximum Lc. The centre of pressure travel for sections No. 40–No. 43 is plotted in the usual manner (Plot 9). Fig. 3 shows the master section and Fig. 10 shows the front profile of the wings. Although drawn to scale, they are not intended as accurate representations of

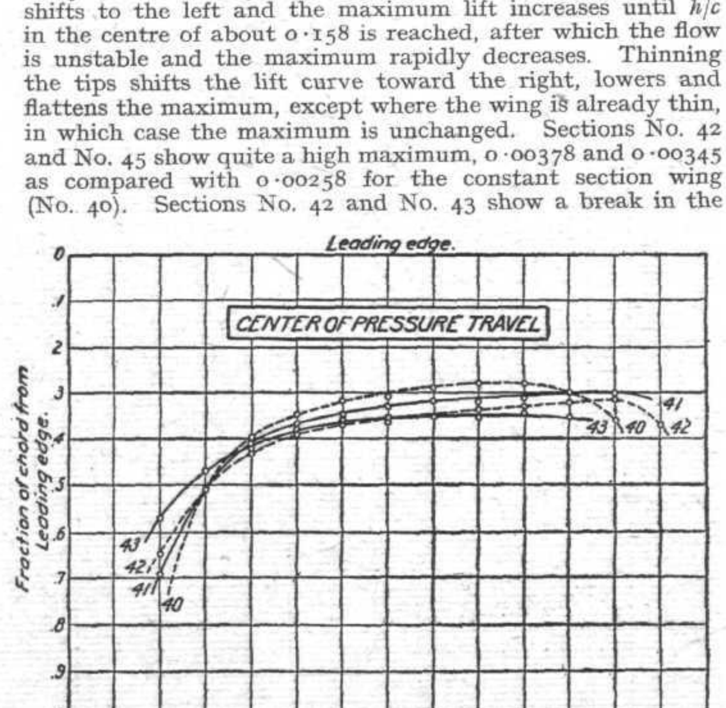


Plot 8.

the wings, but simply to show the relative shape of the sections.

The following facts are evident from the curves :—

Lift.—As the wing is thickened in the centre, the lift curve shifts to the left and the maximum lift increases until h/c in the centre of about 0·158 is reached, after which the flow is unstable and the maximum rapidly decreases. Thinning the tips shifts the lift curve toward the right, lowers and flattens the maximum, except where the wing is already thin, in which case the maximum is unchanged. Sections No. 42 and No. 45 show quite a high maximum, 0·00378 and 0·00345 as compared with 0·00258 for the constant section wing (No. 40). Sections No. 42 and No. 43 show a break in the



Plot 9.

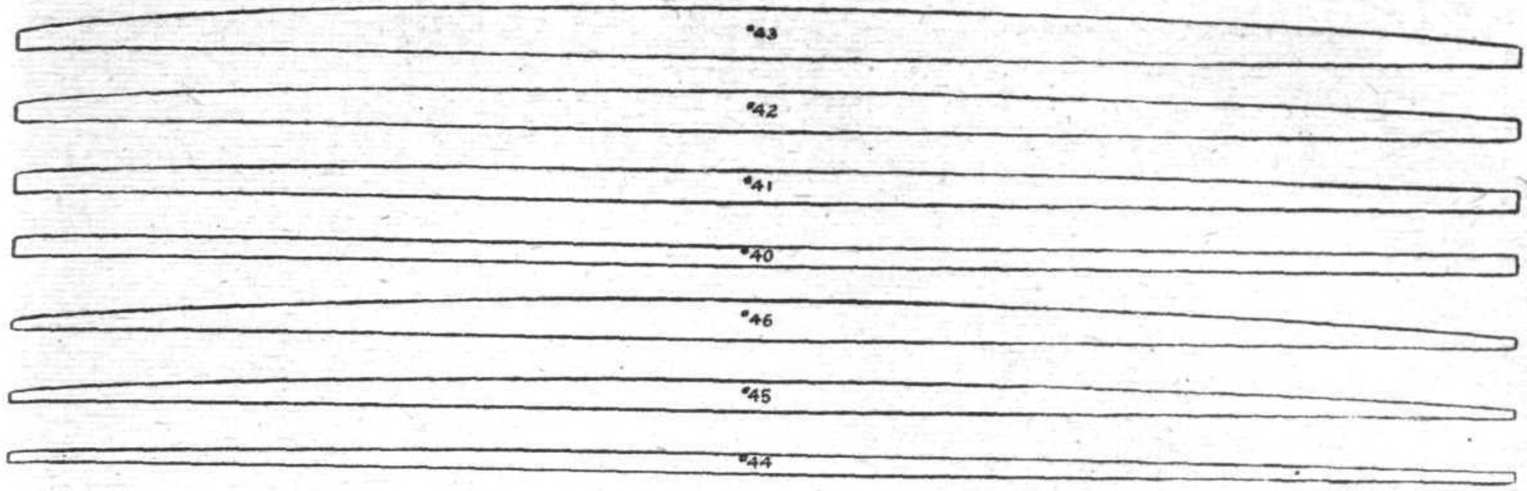


Fig. 10

air flow that is common in many thick sections. At certain angles of incidence there may be two or even more types of flow. This condition is somewhat analogous to a supersaturated solution, as a given type of flow can be carried beyond its normal point of breaking if the angle of incidence is changed slowly and carefully, but if jarred or left for a considerable time will revert to its stable value. This instability is lessened and in some cases disappears with an increase in velocity to 40 m.p.h. This instability of flow is also associated with aspect ratio, for even the R.A.F. 6 shows a break in the lift curve at very low aspect ratios.

Drag.—The minimum drag decreases with the thickness of the centre section, reaching the rather low value of 0·0048 for No. 44. The thinner sections, however, show a pronounced increase in drag at high angles, 14° to 20°, in fact, exceeding the drag of the thicker wings. Thinning the tips decreases the drag at all angles.

L/D.—The L/D increases at all angles as the wing is thinned down. With reference to Plot 8, the thickest wing, No. 43, gives a comparatively poor performance, while the thinnest, No. 44, is shown to be most excellent in this respect; the other sections falling between them. The max. L/D ranges from 13 to 18·2, increasing progressively as the wing is thinned.

Centre of pressure.—The centre of pressure travel becomes less, and the C.P. is slightly farther to the rear as the thickness is increased. The travel on No. 40 lies 28 per cent. from the leading edge at 12° and 51 per cent. at 0°, while on No. 43 it moves, between the same angles, from 35 to 47 per cent.

This test shows that a thin flat-bottomed wing (No. 40) may be thickened in the centre until an h/c ratio of 0·158 is reached (No. 42), with an increase in maximum lift of 50 per cent. and a decrease in the maximum L/D of 18 per cent. and in the L/D at one-ninth maximum Lc of 30 per cent. If at the same time the tip is thinned to an h/c ratio of $\frac{1}{25}$ (No. 46), the maximum lift is increased 32 per cent., the maximum L/D is reduced 12 per cent., and the L/D at one-ninth maximum Lc is reduced 18 per cent. as compared with No. 40. The thickness cannot be increased beyond this, for the maximum Lc and L/D fall off rapidly. If a flat-bottom section (No. 40) be thinned at the tips to an h/c ratio of one-twenty-fifth (No. 44) the maximum lift is unchanged, but the maximum L/D is increased 6 per cent., and the L/D and one-ninth maximum Lc is increased 20 per cent. The wing is, of course, of no use for internal bracing, but is included in this report to complete the series.

There is no particular reason why these sections should be compared to No. 44, as this was simply a reduction of the master section to the thickness of an average wing. It happens to have a fairly good L/D and a rather low maximum lift. For a more general comparison, section No. 46, the most practical section for internal bracing, can be compared with a high lift section, U.S.A. 2. Section No. 46 has a 7 per cent. increase in maximum lift, and a 3 per cent. decrease in maximum L/D over the U.S.A. 2, and the L/D at one-ninth maximum Lc is 30 per cent. higher on section No. 45.

(*To be Continued*)

◈ ◈ ◈ ◈

Air Ministry Loses its Secretary

The Minister of Health has appointed Sir William Arthur Robinson, K.C.B., C.B.E., the Secretary of the Air Ministry, to be First Secretary of the Ministry of Health, in succession to the late Sir Robert Morant.

Advisory Committee Reports

The following reports of the Advisory Committee for Aeronautics were published by H.M. Stationery Office during the month of March, 1920:—

241*r*. Investigation of the Fracture of Exhaust Springs. (Revised). (With diagrams.) March, 1916. Price 4*d*.

256. Wing Forces on Aeroplane Struts and Wires. (With diagrams.) June, 1916. Price 1*s*.

627. Design of a Recording Three-dimensional Accelerometer for use in Aeroplanes. Price 3*d*.

638. Longitudinal Stability of an Aeroplane. September, 1919. Price 6*d*.

Previous lists appeared in Flight, July 3, 1919; October 23, 1919; February 19, 1920.

Air Ministry Workers' Conditions

The Air Ministry Industrial Whitley Council have now approved draft constitutions for Works, Department, and Shops Committees. It is intended to proceed with the formation of such Committees at Air Ministry industrial establishments as rapidly as circumstances permit, and representatives of the Council will visit the principal establishments to assist in the matter. The Council have appointed a committee to consider draft regulations governing employment of civilians at Air Ministry industrial establishments.

Flying Between U.S. and Canada

Two officers of the American Army Air Service, Col. H. E. Hartney and Capt. Douglas, arrived at Ottawa on April 17 on a De H. machine after a direct flight from Washington, which was made with one stop in two minutes over four hours.

Their mission was to confer with the Canadian Aviation Board on flying between the two countries, and they are the guests of the Canadian Government. Both officers are Canadians, and served in the Royal Air Force during the War, after which they joined the American Army.

Capt. Matthews Crashes

Just when he seemed to have mastered his troubles and be almost certain of reaching Australia, Capt. Matthews met with disaster. He was landing at Grokgak, near Singga Radja, the capital of the Island of Bali (East Indies) when his machine crashed and was so hopelessly smashed, that there seems to be no hope of repairing it. Capt. Matthews had still about 1,100 miles to go to reach Australia.

The Rome-Tokyo Flight

Two of the competitors, Capt. Gordesco and Lieut. Grassi were killed in the crash of their machine when attempting to land near the French Consulate at Bushire on April 13. Capt. Ranzi and Lieut. Marzari arrived at Baghdad on April 12 and left the next morning for Basra. Lieut. Ferrarin left Rangoon on April 14 for Bangkok, and the next day he left there for Hanoi. Capt. Masiero arrived at Hanoi on Saturday and was preparing to go to Canton at the first opportunity.

AIRISMS FROM THE FOUR WINDS

WHEN the Navy, Army and Air Force Royal Tournament opens at Olympia on May 20 under the active patronage of the King, new features of military and aerial life will be shown by drafts sent by the Admiralty, War Office and Air Ministry, Overseas troops being represented.

IN their revised form, the rules governing the Air Ministry competitions, which we are able to publish this week, meet several of the objections raised by prospective competitors in regard to the original draft. An endeavour has been made to rule out freak machines, and the sub-division of the 'planes into two classes for small machines with seating capacity up to six persons and for a larger type carrying seven or more in each case exclusive of the crew, is an improvement. The system of marking is also to be commended, as it provides encouragement to designers to obtain the maximum efficiency for practical work.

ANOTHER important publication issued this week is the annual report of the Advisory Committee for Aeronautics, of which a brief summary is given elsewhere. The tables of performance are facts of a most encouraging nature, and in the concluding remarks of the Committee, prefacing more detailed data associated with progress attained, the Committee state that they "feel that it is appropriate to conclude this review of their activities during the War by urging and insisting once again on the essential and immediate importance of greatly increased activity in the investigation of the new problem of flight, which is undoubtedly destined to exercise an ever-increasing influence on the future history of the world. Knowledge of the fundamental principles of the science of flight is still at the beginning, the developments which have taken place in their application, even during the last five years, are relatively small. The expenditure now incurred in scientific and industrial research in aeronautics is utterly insignificant in comparison with the sums expended, and which will be required, in the manufacture of aircraft for the purposes of civilian flying and for defence. Wise forethought, an instructed economy, demand that greatly increased facilities be provided without delay for the study of the scientific and technical questions awaiting solution, to minimise wasted effort, and to lay down a sure foundation on which succeeding generations may build with security."

THAT the Felthamites, headed by the Council's 75-year-old Chairman Mr. J. A. Parker, were in deadly earnest in their determination to assert the public right to the usage of the bridle-path across Hanworth Park, so arbitrarily closed by the Air Ministry for aircraft construction and aerodrome purposes during the War, was demonstrated last Saturday afternoon. A determined "army" of some thousands sallied forth, and with the aid of a scaffolding pole and other "weapons" forced a passage by battering down a portion of the brick wall which had been erected, barring access to the path. The scene is described by an onlooker, who states that a huge crowd mustered on the village green, and, led by Mr. Parker and the vicar, the Rev. F. J. Browell, with most of the public men of the neighbourhood, they made a detour of Hanworth Park. The procession entered the bridle-path on the Hanworth side, and, reinforced by a large contingent from the village of Hanworth, traversed the disputed route for about half a mile to the Feltham exit, where the lofty brick wall barred a passage. At a given signal, a party of men armed with scaffold poles charged the obstruction, and, in less than half an hour, demolished it amid the cheering of the crowd. All then passed through and made their way back to the village green, where they were addressed by their leaders amid a scene of enthusiasm.

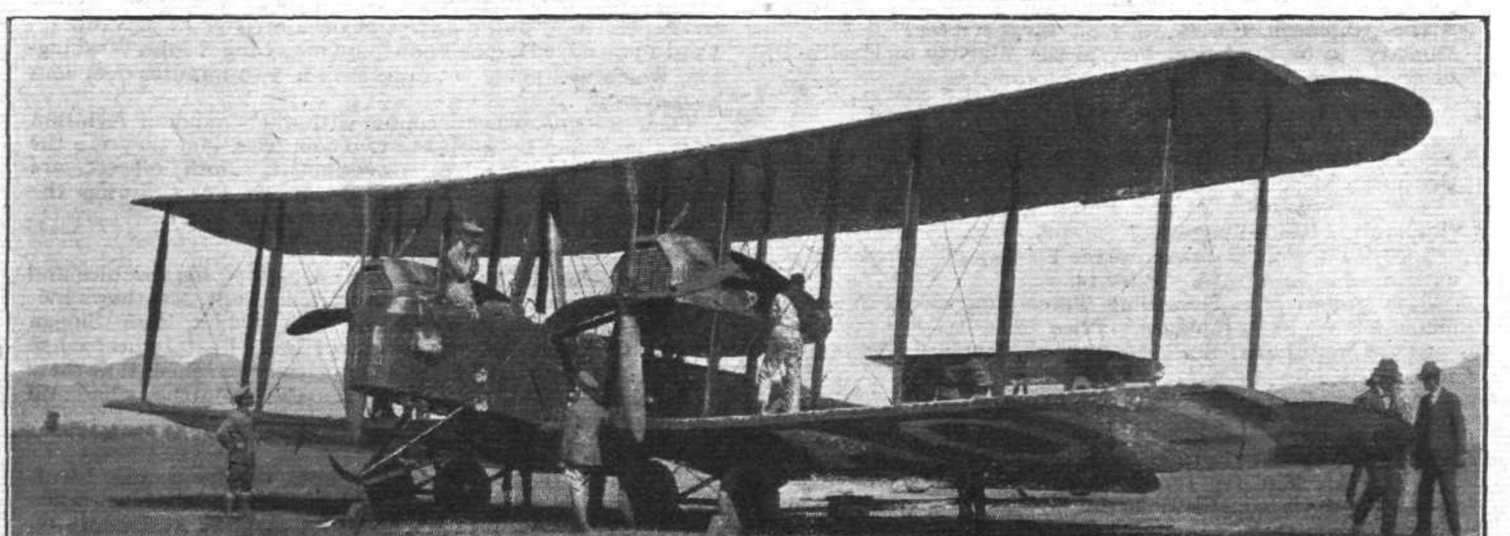
Names and addresses of the councillors and others who took part in the battering down the wall were taken by the police, of whom a strong force, mounted and on foot, were in attendance.

THIS is direct action for the abolition of Dora's pranks with a vengeance.

WHO will be the first to get through a "special correspondent" interview with Mars? Signor Marconi is probably, in spite of half-hearted denials, an entrant for the honour, whilst Professor David Todd, former head of the Astronomical Department of Amherst College (U.S.A.), is an open competitor for testing the possibility of communicating with Mars or any other old planet which happens to be in the line of resistance. This week, when Mars is the mere bagatelle of 55 million miles from the earth, the Professor proposes to ascend from Fort Omaha, Nebraska, to an altitude of 50,000 ft. in a specially constructed balloon, piloted by Leo Stevens, and accompanied by Col. Jacob West, commanding officer at Fort Omaha, one of the War Department's most distinguished experts.

The plan, for which preparations have been made for five years, is to use the balloon as a relay station for wireless impulses sent out from earth.

At the altitude the balloon is expected to attain it is believed there will be no atmospheric interferences, and that



Sir Ross Smith at Richmond, N.S.W., getting ready

(Photo. by courtesy of the Palmer Tyre Co.)

relayed impulses will continue on into the ether until they arrive at Mars, or any other planet which may happen to be within reach.

With specially devised instruments Professor Todd will "listen in" for any passing impulses, and these will be recorded on a super-sensitive plate, which will be developed on *terra firma*, and the sound intensified till it can be heard.

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IT is assumed by the Professor that if, as Marconi and others believe, the Martians are trying to communicate with us, they are sufficiently advanced in knowledge to make a serious effort when the two planets are nearest together. All the facilities of the War Department's chief balloon school have been placed at Professor Todd's disposal, and experts of the Rockefeller Institute and John Hopkins University are co-operating with the loan of specially invented scientific instruments. Several flights probably will be made before the results of the experiments are made public.

BRONZE medals are to be presented this week to the buglers who sounded the "All Clear" signals after air-raids in Wandsworth from 1915 to 1918. The ceremony takes place at the Council House on Friday at 6 o'clock.

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"PUSSYFOOT" is to rule at Waddon, London's air-port. Last week, owing to some informality in the application the Croydon Bench could not see their way to confirm the full licence asked for by the proprietors who have taken over the "hotel" and refreshment arrangements at the aerodrome. So for a year at least probably travellers by air and others having business at the air-port, must see they take their own dope with them, at least those who still have under the new Budget enough money left to settle for a thirty under.

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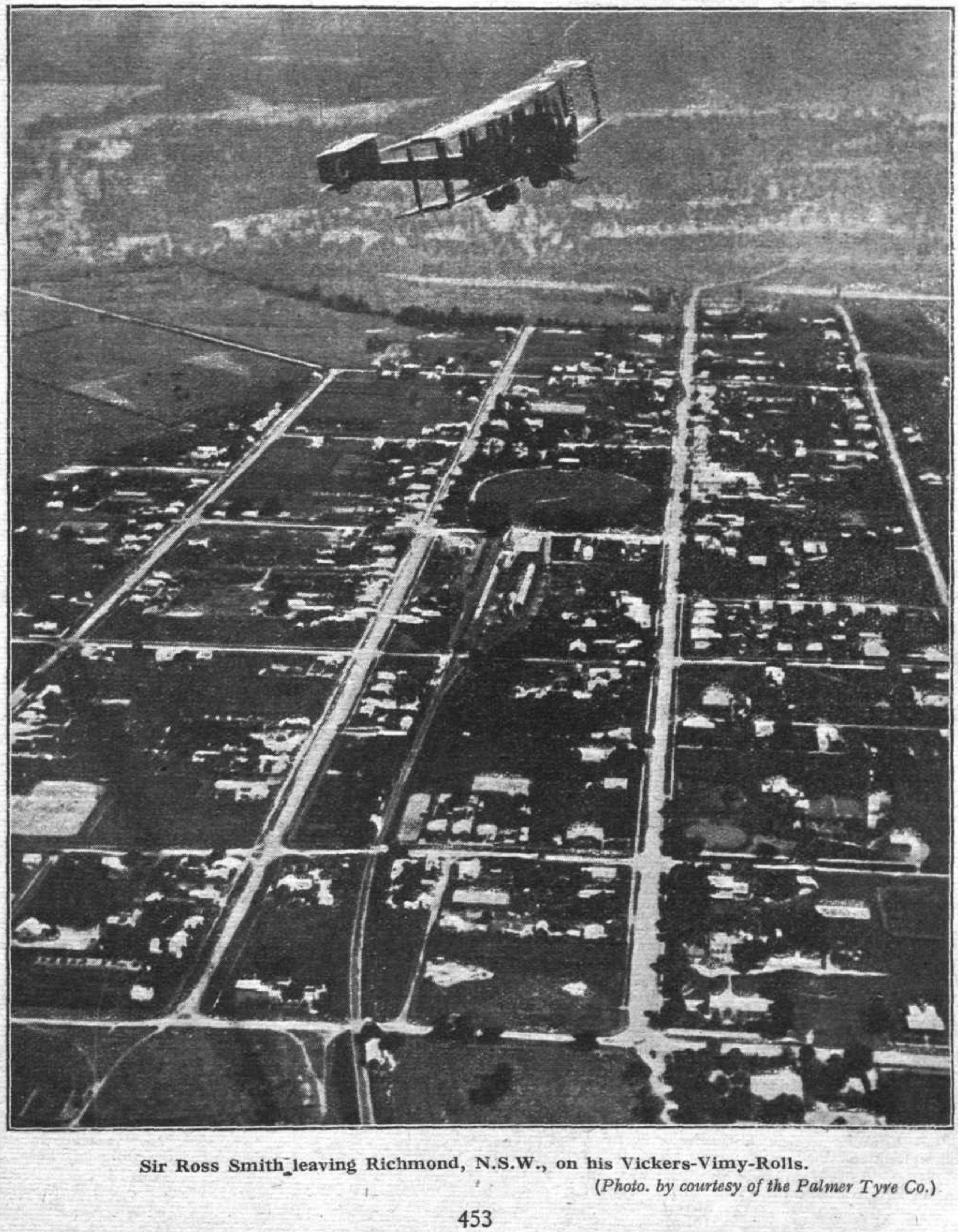
"AERONAUT," in the *Observer* of Sunday last, in criticising a statement that at 5,000 ft. the vision extends to 100 miles



Sir Ross Smith leaving Richmond, N.S.W., on his Vickers-Vimy-Rolls.

(*Photo. by courtesy of the Palmer Tyre Co.*)

and other matters, gives some very interesting facts, and raises points well worth discussion. The writer states that with a sea-level horizon one can only see 71 miles from a height of 5,000 ft. It requires a height of 10,000 ft. to see 100 miles theoretically. In practice nothing like these distances can be seen. Even in the clear air of the Himalayas it is very rarely that the highest peaks can be seen from equally high peaks 200 miles away, though 250 miles has been claimed occasionally.

It would be interesting to hear, "Aeronaut" says, authentic vision records. The writer has seen Teneriffe nearly 100 miles off, a day's run in a sailing ship after leaving it and, in the South Polar regions, by refraction, Mount Harrington in Graham's Land (about 9,000 ft. high) a good hundred miles away; but refraction down there may be as much as seven degrees, which is enough to knock the laws of optics into a cocked hat. Through the same cause he once saw the sun rise inside the Antarctic Circle (lat. 75 deg. S.) a full week after it had set for the long polar night.

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IN regard to another statement made that a parachute may take 45 minutes to descend 5,000 ft., this, "Aeronaut" says, is also incorrect. "Aeronaut" states he has made numerous descents, and never once occupied more than one minute per 1,000 ft. It depends, of course, entirely upon the area-weight ratio, but it would need a parachute about 200 ft. diameter to descend with a 160-lb. man so slowly as 5,000 ft. per three-quarters of an hour (*i.e.*, nine minutes per 1,000 ft., or 1·8 ft. per second). A parachute of this size would bring down nearly a hundred men at the normal life-saving parachute speed of 16 ft. per second. With a speed of descent of only 5,000 ft. in 45 minutes the shock of landing would not be nearly so great as that of jumping off a 4-ft. wall, indeed it would be less than that by jumping off an average curbstone of 6 ins. With the regulation-sized life-saving parachute of 28 ft. diameter, having a terminal velocity of about 16 ft. per second, the shock of landing is about equal to that of jumping off a 4-ft. wall.

The professional and military parachute has always been in the neighbourhood of 28 ft. diameter, though Mr. Henry Spencer, the well-known professional aeronaut, has used one as small as 18 ft. diameter, and a parachute of 16 ft. diameter, has been employed by a light-weight American professional.

In his remarkable descent from 10,800 ft. in November, 1915, General Maitland, C.M.G., D.S.O., A.F.C., Director of Airships, used a 32-ft. parachute. He was in the air exactly 15 minutes, giving a rate of descent of 12 ft. per second. Incidentally, the parachute swung so much that he was sea-sick.

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THERE is a fable handed down from one aeronautical book to another, "Aeronaut" continues, of Frau Poitevin, a female parachutist of 1850, who is said to have taken 49 minutes to descend only 6,000 ft. It is claimed that her husband, from whose balloon she made the descent, reached the ground first, and had the balloon partially packed up before she alighted. Her parachute was 40 ft. in diameter, and, taking her weight at only 100 lb., she could not have occupied more than 20 minutes descending. Presumably, the old chroniclers included the time of ascent in the total. An even earlier experimenter, Robertson, at Vienna, about 1825, is recorded as having taken 35 minutes to drop 10,000 ft. with a very large parachute, but little reliance can be placed on these early records.

It is quite likely, however, that Herr Poitevin did actually reach the ground before his parachuting spouse, for balloons frequently descend at much higher velocities than parachutes until, on nearing the ground, the aeronaut discharges a quantity of ballast and arrests the momentum.

Coxwell and Glaisher descended 10,000 ft. in their balloon at Newhaven in only four minutes to avoid being carried out into the Channel.

The area of a modern aeroplane is so small in proportion to its weight that if it were possible to make it act as a parachute the speed of descent would be fatal. By "planing" a reaction is set up by which, in a manner of speaking, the vertical speed of descent is transformed into horizontal speed.

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PROFESSOR H. MAXWELL LEFROY, F.E.S., in a lecture on the subject of "The Menace of Man's Dispersal of Insect Pests," levels a novel indictment against, *inter alia*, the aeroplane, brought about by the ever-increasing facilities of transport and travel, including the aeroplane. The professor, who said he particularly desired to draw the attention of the Government to the matter, pointed out that in the past many serious pests had been carried from one country to another. He mentioned some 20 types. In 1909 the cotton boll weevil, introduced into the States from South America, caused a loss of 400,000 bales of cotton, valued at £4,000,000. The gipsy moth which got into the States did even greater damage. From 1891 to 1900 the State of Massachusetts alone spent £200,000 in fighting the pest. These were only one or two instances of the enormous loss inflicted by insects. When he said that in his opinion the damage and danger from insect pests were going to be much worse in the future, he had several reasons. In the first place the world was rapidly being linked up by railways; one of the greatest new railway enterprises was that from Cairo, through Turkey to Basra, and there was the Cape to Cairo railway. These railways joined up and brought into touch countries which at the present time were not only isolated but enjoyed immunity from certain tropical diseases by reason of their isolation. There was no doubt that intercommunication by railway introduced a new and dangerous factor in the dissemination of pests and diseases.

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PROFESSOR LEFROY continuing, said he was afraid the aeroplane was also going to prove a source of infection. In illustration of his remarks in this connection he showed a number of slides of aeroplanes, and pointed out that in recent months a Vickers-Vimy machine has made several remarkable journeys half across the world. An aeroplane can cross the Mediterranean from Europe to the African Continent in a night. Taking up from one field and setting down in another field, such an aeroplane was a disseminator of serious, and possibly dangerous, pests; for an insect which would not survive a long journey would and did survive a night. As an incontrovertible instance of this new aspect of pest dissemination the lecturer said that Mr. Cockerell, one of the pilots of the great flight made by Dr. Chalmers Mitchell across a great part of Africa, told him that they stayed one night at a place where the aeroplane was attacked by white ants. The tremendous rapidity of the plane could readlly distribute these insects to a part where they had not previously existed. An aeroplane, for instance, could easily fly from the West Coast of Africa to Brazil in a day. There was yellow fever in Brazil at the present time caused by the yellow fever mosquito. There was sleeping sickness in Africa caused by the tsetse fly. He, Professor Lefroy, had no desire to be alarmist, but he must say that it would be foolish to ignore the possiblity of these pests being introduced into countries hitherto immune by means of the aeroplane. Up to the present time these tropical and Eastern insects and pests had perished before they reached Europe, because the "carriers" had taken days and weeks in a journey.

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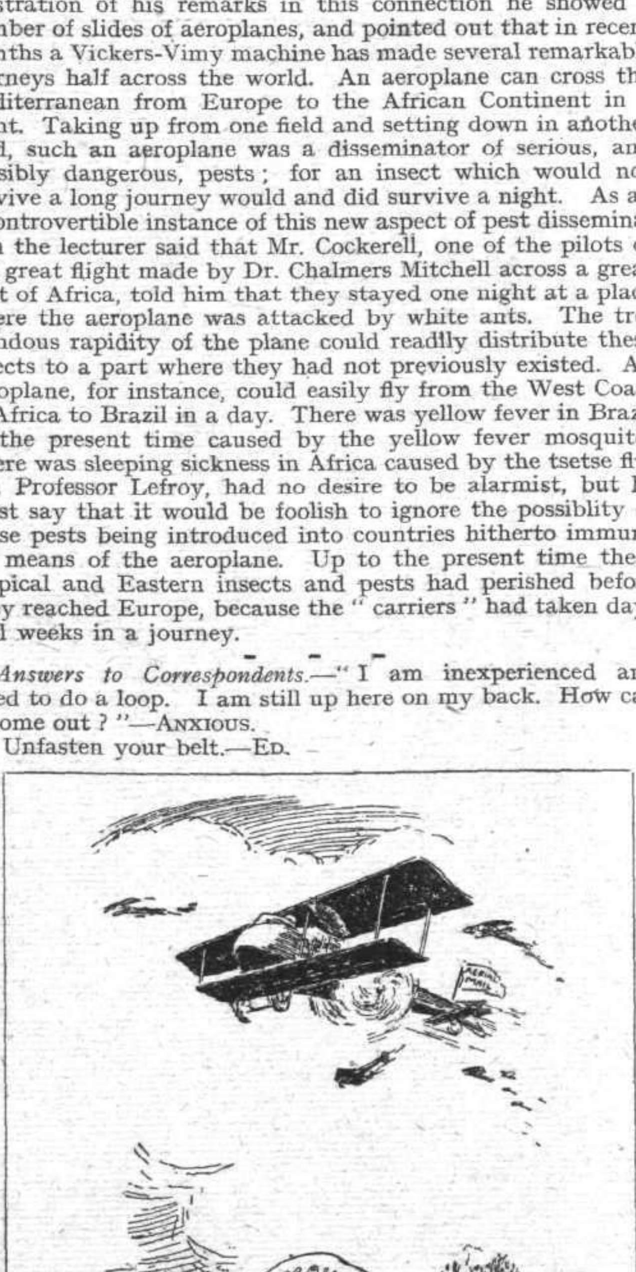
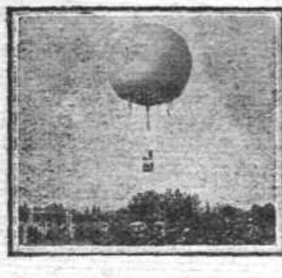
Answers to Correspondents.—"I am inexperienced and tried to do a loop. I am still up here on my back. How can I come out?"—ANXIOUS.

Unfasten your belt.—ED.



THE RIVALS.—His Majesty's Mail: "Here—what's your hurry?" (*Sydney Bulletin*)



AIRSHIPS

THE COMMERCIAL FUTURE OF AIRSHIPS *

By Air-Commodore E. M. MAITLAND, C.M.G., D.S.O., A.F.C. (Royal Air Force).

Introductory remarks.

The airship has two distinct uses, service and commercial. The chief service functions of the airship are, broadly speaking, extended and fast patrol, convoy and scouting duties for which the rigid and non-rigid airships each have their use. The commercial function of the airship is rapid long-distance transport, and for this purpose the rigid airship is the most suitable type. It is with the commercial future of the rigid airship that I propose to deal to-day.

A question of great practical importance in the preliminary consideration of airships is the interchangeability between the Service and the commercial airship. The airship, although already developed to the stage of great utility both for Service and commercial purposes, is not yet highly specialised, and its rapid conversion from one use to the other is a matter of comparative ease. The hull in both types will, for many years to come, be the same, and it is, broadly speaking, merely a matter of replacing the commercial accommodation with bombs, machine guns, etc., to convert the commercial rigid into a most efficient Service airship. This interchangeability is far more marked than in sea-going vessels. The airship of to-day, as far as its adaptability is concerned, should be compared to the sailing vessel of Elizabethan time, ready at her country's need to become a ship of war and capable of as rapid conversion. This question of the interchangeability of the Service and commercial airship is of extreme importance, as on it depends the logical and economical method of future development.

The close association between the Navy proper and the Mercantile Marine has been proved beyond question an unqualified success in the Great War. Many of the auxiliary vessels, from mine-sweepers to auxiliary cruisers, which were previously anything from trawlers to liners, were of extreme war value. There is no doubt that the policy of a Royal Naval Reserve saved the country considerable expense during peace time, by allowing the Naval forces in war time rapidly to expand to a strength which would have otherwise been impossible. An almost exact parallel can be drawn in the case of the airship. The required number of surplus air personnel not required in peace, but of vital necessity in the event of war, can be kept economically in training by the existence of a Commercial Airship Service. Economy will be essential in all matters for many years to come, and I hope I have made it quite clear that the necessary reserve of airships and personnel to meet the exigencies of war can be economically provided by a Commercial Airship Fleet.

Development and effect of transport and communication

Everything in civilisation ultimately depends on transport and communication, which may be termed the machinery of civilisation, and if civilisation is to progress, transport and communication must be developed. The study of the effect of transport and communication on history is of absorbing interest, both in indicating the line along which they should be developed in the future, and the benefits humanity may expect to obtain. If ancient history is studied from this point of view, the almost mathematical relation between size of empire and case of transport and communication becomes apparent. Probably, the most outstanding example is that of the Roman Empire, and the gigantic development in road transportation achieved during its existence.

An example of the effect of transport and communication upon history in more recent times is the difference between the effects of the American War of Independence and the Boer War. In the first case, much bloodshed and bitterness of feeling between Great Britain and America resulted, taking over a century to heal. In the second case, twelve years after the fighting ended, South Africa was one of Great Britain's most loyal partners in the World-War.

The two countries, America and South Africa are, practically equidistant from Great Britain. The statesmen of to-day are, presumably, no wiser and greater than those of 200 years ago—I say this with the greatest diffidence!—the great factors which have changed are transport and communication. Slow and difficult communications caused misunderstanding—rapid and easier communications led to understanding and mutual adjustment.

Transport has similarly altered the whole character of war. Wars began as small club or bow-and-arrow affairs between neighbouring villages, which, as transport facilities improved, joined themselves into states and countries, thus extending the magnitude of their wars. Almost invariably, wars, in the last 1,000 years, have been waged between countries and not between isolated parts of a country, culminating in the World-War.

Looking into the future, history thus seems to indicate that as civilisation and the machinery of civilisation—transport and communication—develop, some form of central government will ultimately arise which will control the whole world. At the present time, however, it is true to say that no stable form of central authority, whether it be a League of Nations or anything else, can be maintained unless existing transport and communication facilities are considerably improved.

Limitations of existing means of transport.

Just as in the case of an airship, sea-going vessels increase in performance with increase in size, and it is seen that between the great centres of population, notably between America and Europe, where high-speed transport is in great demand, the largest liners are used to meet the exacting requirements of high-speed and long distance. To build a liner with the necessary speed for the Trans-Atlantic service, it is essential to provide a very large hull to carry the powerful engines and large amount of fuel required. Owing to the necessarily very large size of these ships, an enormous number of passengers must be carried, so great a number, in fact, that it is impossible to operate these large liners at a profit anywhere except between the very greatest centres of population. Between centres of lesser population there would not be sufficient demand for the large amount of comparatively expensive accommodation.

This limitation is illustrated in the case of the service between this country and Australia. Recently, owing, possibly, to the advent of aircraft with their high speed, a determined effort was made by Australia to shorten the time of passage between Australia and this country. Apparently, the steamship companies are quite unable to provide any material improvement in this direction, as they point out that to produce such improvement it would be necessary to construct ships of such a size that they would be out of proportion to the volume of traffic. In any case, the Suez Canal would prevent the use of the largest liners.

In the case of airships of the very largest size contemplated, the number of passengers, mails, etc., carried would be so small compared with large liners that they could be run over routes where the traffic would not warrant the use of these very large liners.

It is, therefore, on the main sea routes that the airship will have its great opportunity, and I hope to show later in the paper that it can operate on such routes at commercial prices. Successful competition between aircraft and existing means of land transport is a much more difficult matter than over sea, owing to the higher speed of land transport; and though ultimately aircraft may compete successfully for the most rapid transport requirements, it is unlikely in the near future that air transport will be a serious rival to the existing forms of land transport in developed countries. For routes over both land and sea combined, aircraft have a distinct advantage, owing to the time wasted in changing from train to ship. Over this type of route commercial aerial activity was, as we all know, first instituted in the case of the London-Paris and London-Brussels aeroplane passenger and mail services.

* A paper read before the Royal Society of Arts, on April 21, 1920.

The Need for High-speed Transport

It cannot be too strongly emphasised that the *unit* in life is *Time* not Distance, and the *Distance* between two countries is in practice measured by *Time*. Out of the six main factors in transport, the claim of aircraft for an assured future is based on *speed*, that is reduction in the *time* taken by transport. Transport is governed by six essential factors :—

(1) Safety ; (2) regularity ; (3) carrying capacity ; (4) comfort ; (5) speed ; (6) cost.

The relative importance of these factors varies according to the special object in view, and even similar goods transported over the same route may require different types of transport. The state of the existing means of transport is a vital consideration in developing any new form of transport. To compete with the existing forms of land transport, where goods can be conveyed at 60 miles an hour and over (varying with the state of development of the country), the speed of any new type of transport obviously must be greater than is necessary to compete with sea transport where the present speed is less than half as fast as on land. Transhipment from train to surface craft still further reduces the mean speed of existing transport and favours air transport.

Meteorology and the Choice of Airship Routes

The choice of airship routes depends so very largely on the prevailing weather conditions and position of the permanent winds that the two subjects must be dealt with together. I would like to emphasise the importance of accurate meteorological information for all forms of aerial transport. Winds of 40 m.p.h. will often be encountered. These will usually be local in area, and will vary greatly in force and direction at different heights above the ground, and if accurate meteorological information is available these winds can frequently be used to assist the airship instead of constituting a hindrance. If full use is made of these winds, both in regard to original choice of routes, and in the actual flying over these routes, the speed made good over the ground can be made to exceed the actual air speed. As meteorology and our own flying experience develops, the winds should ultimately become less of an enemy and more of a friend.

Winds may be divided into two classes : *permanent* winds and *variable* winds. The *permanent* winds are the more important in original choice of routes, and consist chiefly of the trade winds and the westerly drifts. Generally speaking, the winds just north or south of the equator are easterly and the winds near the poles westerly, so that a ship flying east would endeavour to choose a route in latitudes from 15° to 30° north or south, and when flying west in latitudes between 45° and 50.°

Thus, the route from England to Australia crosses the easterly winds practically at right angles, and turns east from the Cape, making use of the permanent southern westerly drift, or "roaring forties." The return journey is made nearer the equator to use the easterly trade winds or easterly slants. The Atlantic route is similarly dealt with. There are also many other less important permanent winds, and also seasonal winds, which can be made use of, and will slightly modify the routes during different periods of the year. The *variable* winds are the winds which are directly due to depressions, and can only be used provided accurate meteorological information is available. The ability to use these variable winds depends largely on the speed of the airship, as the pilot will often find it necessary to push through a narrow belt of strong wind in order to gain the advantage of a favourable wind later.

As mentioned later, electrical storms form a potential danger to all forms of aircraft, but as the area in which such disturbances are prevalent can be very accurately charted, the routes will be chosen so as to avoid these areas and thus reduce this danger to a minimum. Reliable weather forecasts necessitate a large number of accurate observations being taken over very extended areas, and to run an organisation especially for this purpose would be extremely costly. If, however, arrangements were made for all sea-going ships fitted with wireless, also the various shore wireless and cable stations throughout the world, to take and transmit meteorological readings, it would probably be possible, in time, to organise an adequate meteorological service for little cost, special meteorological stations only being required in a few isolated positions.

Commercial Capabilities of Airships

Having dealt very briefly with the fundamental aspects of sea routes, land routes, and routes over both sea and land, I now propose to consider the capabilities and limitations of airships with regard to the essential transport requirements.

(1) *Safety*.—This term must, owing to the nature of all forms of transport, be purely relative. Even in the most "safe" form of transport there is always some small risk. The airship is definitely the safest method of air transport, and if the statistics are studied for the pre-War commercial airship flying in Germany, the very extensive War flying of the German Zeppelins, and the 2,500,000 miles flown by the British airships during the War, it will be seen that, excluding enemy action, the loss of life is extraordinarily small. The danger in soundly-built well-equipped airships flown by competent personnel is so small that, in my opinion, it will come to be regarded as nothing more than an everyday risk.

In the case of sea-going ships during the last hundred years, the safety has been very greatly increased, due mainly to the increase in size and the use of more powerful propelling machinery, enabling the modern ship to meet the worst storms without much fear of foundering or of being driven on to a lee shore. The same improvements are to be expected in airships, and the larger airships of the future, fitted with more powerful and reliable machinery, will necessarily be still safer than the airship of today.

Modern airships have proved themselves capable of flying through practically any type of weather. There is, no doubt, however, as already stated, that at present the most violent types of electrical storms are an undoubted danger to all forms of aircraft. Fortunately, however, although the wind speed in the centre of these disturbances has been known to reach as much as 300 miles an hour, the actual speed of such a storm over the ground seldom exceeds 50 m.p.h., and with ordinary navigation there is no reason why airships should blunder into the centres of such storms. At the worst, the danger from violent electrical storms appears to be less than the danger of rocky coasts and shallows to the sea-going ship.

Another important factor in the safety of airships is that all minor repairs engine can be carried out whilst flying. Also, owing to the number of separate machinery units, serious engine failure is reduced to a minimum.

Fog does not constitute a real danger to airships. With present methods of navigation it is not necessary to see the ground in order to navigate accurately between bases. The bases, however, should be situated in localities comparatively free from fog to prevent delay in landing.

(2) *Regularity*.—If transport by air is to possess anything more than a very limited future, it must be possible to know beforehand when the machine is going to leave and approximately when it is going to reach its destination. Regularity in this direction is essential. The chief cause of irregularity for airships up to the present has been wind, the main difficulty being the handling of ships on the ground, and the impossibility of taking them in and out of their sheds in a cross wind of much over 20 m.p.h. This difficulty has now been solved by the development of the mooring mast. With the mooring mast it will be possible for airships to embark and disembark passengers and freight with sufficient ease to meet practical requirements. It will be realised, however, that the selection of the site for all landing bases should always be largely influenced by the local weather conditions, which are not always favourable at the great centres of population.

Irregularity in length of passage due to adverse winds encountered during flight is now the more serious problem. Bad weather is usually confined to small areas, and for this reason, much greater difficulty will be experienced in maintaining regularity over short routes. For the long routes, however, the various weather disturbances will tend to even themselves out, and no insuperable difficulties are anticipated in achieving regularity over correctly chosen routes. An example of regularity obtained even over a short route is afforded by the German airship *Bodensee*, which recently carried out 60 flights between Friedrichshafen and Berlin in 64 days, although she was a new and comparatively untried type of airship.

Carrying Capacity

I think the carrying capacity of rigid airships can be best illustrated by the accompanying table :—

	Bodensee (German)	R. 34 (In commission)	R. 38 (Under construction)	R. X
Length (in ft.) ..	390	639 ft. 5 in.	695	740
Capacity (in c.f.)	700,000	2,000,000	2,700,000	4,000,000
Tonnage	21·3	60·7	82·0	121·5
Maximum speed (in m.p.h.) ..	80	50	70	80

Economical cruising speed (in m.p.h.) ..	60	50	60	60
Freight carried (in tons)—				
For 1,000 miles	·28	9·38 (65)	23·26 (160)	34·64 (240)
For 2,000 miles	—	5·26 (37)	15·00 (105)	22·28 (155)
For 3,000 miles	—	1·14 (8)	6·78 (47)	10·0 (70)

The figures in brackets show the equivalent number of passengers which could be carried, assuming seven passengers to the ton.

A good idea of the passenger-carrying capacity of airships may be obtained from this table. The number of passengers given are, of course, only approximate, and will be limited by the amount of accommodation which could be provided. A maximum of about 100 to 120 passengers is considered quite feasible, the balance of the freight being carried in mails, parcels, and high-grade merchandise.

The following table shows the increase in performance between a 2,000,000 and 10,000,000 cub. ft. capacity rigid, allowing only for the increase in performance due to increase in size. A still further marked increase in performance can, however, be confidently predicted due to improvements in design and to slightly more economical structure which will be practical in the larger ships.

Performance Table

	Rigid of 2,000,000 cub. ft. capacity	Rigid of 10,000,000 cub. ft. capacity
Length	645 ft.	1,100 ft.
Diameter	79·5 ft.	135·5 ft.
Gross lift (at 68 lbs. 1,000 cub. ft.)	60·7 tons	303·6 tons
Disposable lift (60 per cent. gross lift) ..	36·4 tons	182·2 tons
Crew, ballast, food, etc. (15 per cent. gross lift)	9·1 tons	45·5 tons
Dischargeable lift (45 per cent. gross lift) ..	27·3 tons	136·6 tons
Maximum speed ..	68 m.p.h.	78 m.p.h.
70 m.p.h. (normal full speed)—		
Max. range*	67·9 hours 4,750 stat. miles	115·5 hours 8,000 stat. miles
H.P. developed† ..	1,700	5,000
45 m.p.h. (comparison speed)—		
Max. range*	218 hours 9,820 stat. miles	364 hours 16,400 stat. miles
H.P. developed† ..	530	1,580

* Fuel and oil consumption has been taken on the basis of .53 lb. per b.h.p. hour.

† Thrust h.p. has been taken as equal to 70 per cent. of b.h.p. at full speed, and 60 per cent at 45 m.p.h.

(*To be continued*)

AVIATION IN PARLIAMENT

Army and Air Force Annual Bill

IN Committee, on April 13, Lieut.-Commander Kenworthy raised the question as to whether the Air Force should be included in the Army (Annual) Bill, firstly, because by an act of the House, the Air Force was a separate service, and secondly, becausethe time might come when it might be unnecessary to keep a standing Army but very necessary to keep a standing Air Force.

Sir A. Williamson explained that this year a departure had been made in that the Bill was divided into three parts; 1, the Amendments to the Army Act; 2, the Amendments relating to the Air Force; and 3, the Amendments common to both. As to the suggestion that the time might come when the Air Force might be the more important force of the two, they might leave those circumstances to be dealt with as they arose and they would find means of relieving themselves of an unnecessary Army and concentrating upon the Air Force.

Surplus Government Silver Spruce

MR. REMER, in the House of Commons, on April 13, asked the President of the Board of Trade how many standards of silver spruce purchased for aircraft purposes have been sold since the signing of the Armistice; the dates of the sales; the names of the firms to whom they were sold; and the prices realised in each case?

Mr. Hope: I have been asked to reply. A total of 3,145 standards of silver spruce has been disposed of to 60 firms at prices varying from £30 to £100 per standard, according to the quality and condition of the timber sold.

German Guns and Aeroplanes

COMDR. VISCOUNT CURZON, on April 14, asked the Prime Minister the number and calibre of guns and number of aeroplanes now in Germany and capable of being used for war purposes; and what is the number allowed to Germany under the Peace Treaty.

Mr. Churchill, in the course of his reply, said: It is estimated by the Air Ministry that there are now in Germany 15,248 aeroplanes, which could in a comparatively short time be made available, and which would be capable of being used for war purposes. Under Article 198 of the Peace Treaty the armed forces of Germany may not include any military or naval air forces. All aeroplanes in Germany are now in process of being listed, and will be inspected by the Inter-Allied Aeronautical Commission of Control, which is the final authority for deciding which aeroplanes come under the heading of military and naval aeroplanes. All military and naval aeroplanes will then be taken over by the Inter-Allied Aeronautical Commission of Control.

Viscount Curzon: Is it proposed to leave Germany in possession of any military aeroplanes for commercial purposes?

Mr. Churchill: I think my answer fully covers that.

Sir W. Joynson-Hicks: Will the right hon. gentleman see that the Commission gets to work on that subject as rapidly as possible so that Germany may not keep such an enormous number of aeroplanes as 15,000?

Mr. Churchill: The work is being accelerated with the utmost speed; but the surrender of this war material did not become operative until after the ratification of peace, and progress was quite good until the revolution occurred. Since then it has been very difficult to find competent authorities to deal with it. It is gradually improving, and we are pressing forward with the utmost speed.

R.A.F. Recruiting and Discharges

MR. FOREMAN, on April 15, asked the Secretary of State for War whether the Air Ministry is still appealing for recruits; and, if so, why it is discharging the men now in its employ without notice and without any allowance?

Mr. Churchill: The answer to the first part of the question is, that the Royal Air Force have a shortage of men in certain trades and a surplus in others, and that, in consequence, recruits are being accepted for the former trades while men are being discharged from the latter classes. The answer to the second part is, that men are only discharged on the termination of their engagements, except in the case of those who enlisted or extended their engagements under the terms of what is called the Army of Occupation Scheme, by which a man undertook to serve for one year after the termination of the War or for such less period as his services may be required. If a man enlisted for the first time under this scheme after November 11, 1918, he is not entitled to demobilisation benefits. The principle is that no man is allowed to draw demobilisation benefits twice, nor is any man discharged for misconduct entitled to these benefits.

Brussels-Paris Air Service

PROGRESS is being achieved by the Belgian National Syndicate for the study of aerial transports in establishing regular communications by air between Brussels and the neighbouring capitals.

It is proposed that the charge for letters not exceeding 100 grammes shall be 75 centimes, and fares for passengers will not exceed 300 francs for the journey from Brussels to Paris or from Paris to Brussels, and 500 francs for a return journey, including luggage. It is expected that a service will be run in each direction three times a day for passengers, letters, and parcels.

The Leeds to Holland Service

WE are informed that the Leeds to Holland service organised by the North Sea Aerial and General Transport, Ltd., has more than justified itself, and it is hoped to continue a weekly service, although it is not yet possible to work to a regular time-table. During March the Blackburn "Kangaroo" carried some 2¼ tons of goods, valued at about £10,000. It has been suggested that Roundhay Park should be used as the Yorkshire terminus, but investigation showed that the facilities were unsuited for large machines, and Brough is to be retained as the terminus for the present. It is understood, however, that the West Riding municipalities are strongly in favour of the creation of a local aerodrome at either Roundhay or Farsley, and that Government sanction has been requested.

Paris and Brussels Air Services

ON the Handley Page Continental air services run in conjunction with Cie Messageries Aeriennes, Paris, between September 2, 1919, and April 10, 1920, inclusive, 1,196 passengers and 63,961 lbs. of freight have been carried over a distance of 87,769 miles.

With 11 passengers (including crew) and nearly 700 lbs. of freight on board a Handley Page commercial aeroplane, piloted by Lieut. Halliwell, flew to Paris recently in driving rain, low clouds and high wind.

Including a landing at Lympne in order to pick up a passenger, the flight from London to Paris occupied under four hours. This demonstrated the capabilities of the Handley Page machine, which, despite its heavy load, successfully accomplished its journey under the worst possible weather conditions.

Prague-London in seven and three-quarter Hours.

LIEUT. C. R. MCMULLIN, one of the Airco pilots flying in an Airco 9 machine, arrived at Croydon Aerodrome at 1 p.m., on April 19, from Prague, having accomplished the journey of over 700 miles in 7 hours 45 minutes flying time.

Personals

Deaths

Another pioneer of aviation in this country is mourned in Professor A. K. HUNTINGTON, who died suddenly in London on Saturday, aged 68. Until six months ago he was professor of metallurgy at King's College, London, and during the War he rendered good service in connection with high explosives for the Navy. His hobby was aviation, and he took it very seriously, as visitors to the Royal Aero Club's ground at Eastchurch and readers of FLIGHT will remember. He built a machine somewhat reminiscent of the Dunne, but fitted with a tail, and he used to fly it himself. Previous to that he had made many balloon trips, and with his "Zephyr" took part in Gordon Bennett contests in 1906, covering 212 miles, and in 1907, 556 miles.

The death is announced of Mr. FRANK E. PRIEST, chairman of Messrs. A. V. Roe and Co., Ltd., the well-known aircraft manufacturers. He had been chairman of the company for the past eighteen months, having previously taken a keen interest in aeronautical matters. He was a member of the Institute of Civil Engineers, and made extensive investigations on the Mersey and its estuary from January, 1894, to the present time. He has also given evidence thereon in Law and Arbitration Courts, and Committees of both Houses of Parliament on behalf of the Mersey Docks and Harbour Board, and several other parties with reference to the Manchester Ship Canal. He leaves a widow and one daughter.

Flying Officer DESMOND WILKIE SIBLEY, R.A.F., who was killed while on a flight from Khartoum to Cairo, on April 2, at the age of 21, was the second son of Dr. O. Carden Sibley, of Abercorn, Hanger Lane, Ealing.

Married

Capt. RICHARD DINWOODIE, late R.A.F., second son of Mr. and Mrs. Robert Dinwoodie, 26, Derby Crescent, Kelvinside, Glasgow West, was married on April 20 at Colmonell Parish Church, South Ayrshire, to ELIZABRTH DONALD, youngest daughter of Mr. and Mrs. W. S. BRECHIN, Pinwherry House, South Ayrshire.

Flying Officer WILLIAM FREDERICK DRY, R.A.F., son of Mr. and Mrs. W. H. Dry, of Bournville, was married at St. Andrew's, Bournemouth, on April 14, to GWENDOLEN, younger daughter of Capt. and Mrs. L. P. THWAITE (late 14th King's Hussars), of Bournemouth.

Capt. LAURENCE IRVING (late R.A.F.), only son of the late Mr. H. B. Irving and of Mrs. Irving, was married on April 19 at St. Pancras Parish Church to Miss ROSALIND FRANCES WOOLNER.

Squadron-Leader ARTHUR THOMAS WHITELOCK, R.A.F., only surviving son of Thomas Railton Whitelock, of Barnsley, Yorkshire, was married on April 17 at St. Mary Abbots, Kensington, to FRANCES MARY, third daughter of the late Edward BRYNING and of Mrs. Bryning, Kirkham, Lancashire.

To be Married

The engagement is announced of Capt. J. DOVER ATKINSON, A.F.C., F.R.G.S. (late R.E. and R.A.F.), only son of Emily Atkinson, of Sedbergh, Yorks, and FROKEN EMMA DE CONINCK-SMITH, daughter of Enkefrue de Coninck-Smith, of Copenhagen.

The engagement is announced of Capt. SIMON ORDE (late R.A.F.), only son of Mr. and Mrs. Edwin Orde, of 15, Basil Mansions, Knightsbridge, and GEAN, eldest daughter of the late Mr. GEORGE MOSTYN, of Clifton Hill, Garstang, Lancashire.

The engagement is announced of Mr. THOMAS SHEPARD, late R.A.F., eldest son of Maj. and Mrs. T. Shepard, late of Church Brampton, Northants, and CICELY EDITH, second daughter of Dr. and Mrs. R. A. MILLIGAN, of Ardmae, Northampton.

Joy Flying at Douglas

AT a recent meeting of the Douglas Town Council a move was made to have flying from the foreshore prohibited, it being alleged that the flying permitted last year was an encroachment on public rights and a disadvantage to the town as a visiting resort. It was said that people last year had refused to stay in Douglas because their children were prevented from playing on the shore.

It was pointed out, however, that the space occupied for aviation was only 300 yards in a length of two miles. The motion was rejected, and flying rights were granted to the International Aviation Co., Liverpool.

A Meeting at Bournemouth

ARRANGEMENTS are being made to hold a meeting at the Bournemouth Aerodrome on May 1, and the programme includes a cross-country race to Ringwood, for which six entries have been received, parachute descents and stunt flying. A band has been engaged to play during the afternoon, and the evening will be wound up by dancing on the green.

Activities at Northolt

SINCE Easter there has been a great deal of activity at the Central Aircraft Co.'s school at Northolt. Among the new pupils are Mr. C. E. Pitman, brother of the famous I. J., and son of Mr. Ernest Pitman, Lieut. A. Bellingham-Smith, 5th Lancers, Miss Imelda Trafford, Mr. G. G. Grey and Mr. K. Stewart Kurton. The joy-riding season has started early, and among those who have had trips are Sir Charles Russell, Mr. Arthur Russell, the Hon. Mrs. Guinness and their children.

Where the Rates Go Down

THE rates of Ham, Surrey, have been reduced by 5*s.* 5*d.* in the £, or nearly one-half, owing mainly to decisions as to the rating of works formerly used as an aeroplane factory.

An H.P. for an Indian Prince

WORD comes from Bombay that the Thakur Sahib of Morvi has ordered a Handley Page for his personal use. Although he is not the first Indian prince to buy an aeroplane, he is probably the first to buy such a large machine and for personal use.

Aviettes in France

DESPITE their continued disappointments, there are a few brave souls in France who are persisting in their experiments with human propelled aeroplanes in the hope that they will one day succeed in winning the Peugeot prize of 10,000 francs for the first "aviette" to actually fly 10 metres in opposite directions. The favourite form of machine is a bicycle fitted with wings and with the pedals operating a propeller.

Dr. Kapp's Flight to Sweden

FROM further details which have come to hand regarding the flight of Dr. Kapp, the five days' German Chancellor, to Sweden, it appears that on the issue of the warrant for his arrest he went to Pomerania. He got away, from an aerodrome near Stralsund, on a German Government machine piloted by Jüterbock, on April 12, and flying via Denmark, landed on the Swedish coast near Malmoe. The machine was abandoned, the pilot disappeared and Dr. Kapp walked into Malmoe, where his false passport aroused suspicions which led to his arrest at Södertelje, near Stockholm.

M. Fokker Speaks

LECTURING before the Royal Dutch Aviation Association at Rotterdam the other day, M. Fokker expressed the pious hope that it would not be necessary for him to seek financial help abroad again, but that it would be found in his own country. He emphasised the need for developing machines which could leave the ground after a very short run, and instanced his new commercial machine as an example of what could be done. He expressed the idea that the improved reliability of aeroplanes would render seaplanes superfluous for overseas work except for trips between islands. He also pointed out the necessity for the extension of the application of wireless telephone and telegraph, and the improvement of instruments for ascertaining heights, and so on, are necessary in order to make flights possible in fog at night, and under other hampering conditions.

THE ROYAL AIR FORCE

London Gazette, April 9

Administrative Branch

Flight-Lieut. A. Ferris to be Flight-Lieut., from (S.O.); April 9. W. Pritchard, M.C. (Lieut. and Qrmr., Gen. List), is granted a temp. commn. as Lieut.; Oct. 10, 1918 (substituted for notification in *Gazette* of Nov. 26, 1918).

(Then follow the names of eight officers who are transfd. to the Unemployed List under various dates.)

The notification in the *Gazette* of Dec. 12, 1919, concerning Sec. Lieut. J. G. Lebrun is cancelled.

Technical Branch

Sqdrn. Ldr. (actg. Wing-Comdr.) S. S. Nevill, O.B.E., relinquishes the actg. rank of Wing Comdr. on ceasing to be employed as Wing Comdr.; Jan. 25. Sqdrn. Ldr. T. O. Lyons, O.B.E., to be Sqdrn. Ldr., from (S.O.); April 7. Lieut. (Hon. Capt.) (actg. Maj.) C. J. Hardy to be Lieut., without pay and allowances and relinquishes the actg. rank of Maj. on ceasing to be employed as Maj.; July 22, 1918 (substituted for notification in *Gazette* of March 12). Lieut. J. J. Ironmonger to be Lieut., Grade (B.), from (Ad.); Nov. 18, 1918, and is graded for purposes of pay and allowances as Sec. Lieut. Grade (B); Nov. 18, 1918 (substituted for notification in *Gazette* of Dec. 24, 1918).

Sec. Lieut. H. H. Fell to be Sec. Lieut., from (Ad.); Aug. 21, 1918.

(Then follow the names of six officers who are transfd. to the Unemployed List under various dates.)

The notification in *Gazette* of Oct. 29, 1918, concerning Sec. Lieut. H. H. Fell is cancelled. (Notification in *Gazette* of Aug. 20, 1918, under Administrative Branch, to stand.)

Medical Branch

(Three officers transfd. to the Unemployed List.)

Memoranda

Pilot Officers (S.O.) to be Flying Officers.—C. Y. Mitchell, J. Hobbs; Oct 1, 1919.

(Then follow the names of 327 Canadian Cadets granted hon. commns. as Sec. Lieuts.)

(One officer transfd. to Unemployed List.)

Hon. Maj. H. J. Corin, O.B.E. (Dental Surgn., R.N.V.R.), relinquishes his hon. R.A.F. commn.; Sept. 17, 1918.

London Gazette, April 13

The notification in the *Gazette* of Jan. 30 appointing Flying Officer R. J. P. Grebby, D.F.C. (A.), to a short service commn. is cancelled.

Flying Branch

Flight-Lieut. N. H. Bottomley, A.F.C., to be Flight-Lieut. (A.) from (S.O.); April 1. Flight-Lieut. J. Edwardes-Evans (Lieut., R. Welsh Fus.) relinquishes his temp. R.A.F. commn. on return to Army duty; March 30.

(Then follow the names of 20 officers who are transfd. to the Unemployed List under various dates.)

Flight-Lieut. A. J. Michell-Clarke, M.C. (Lieut., Glouc. R.), resigns his commn.; April 14. The following Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—V. Topping (contracted on active service); March 31. J. J. Flynn; April 6. C. W. Locket (contracted on active service); April 12. The following Sec. Lieuts. relinquish their commns. on account of ill-health, and are permitted to retain their rank:—(Hon. Lieut.) W. Cooke (contracted on active service); Sept. 28, 1919 (substituted for notification in the *Gazette* of Jan. 30). A. A. Downs (R. Sussex R., S.R.); Nov. 4, 1919. C. H. Wilcox (caused by wounds); April 6. Lieut. J. Cross (Lieut., R.W. Kent R.) relinquishes his temp. R.A.F. commn. on retirement from the Army; April 11, 1918. The rank of Sec. Lieut. J. M. Brown is as now described, and not as stated in *Gazette* of April 29, 1919. The notification in of*Gazette* June 6, 1919, concerning Sec. Lieut. S. E. Calvert is cancelled.

Administrative Branch

Capt. J. S. Holloway is graded for purposes of pay and allowances as Maj. whilst employed as Maj., from May 1, 1919, to July 31, 1919.

Flight-Lieuts. to be Flight-Lieuts., from (S.O.):—A. J. W. Barmby, O.B.E., E. C. Perrin, O.B.E.; H. R. Kavanagh, M.B.E., J. L. Robertson; April 1.

Sqdn. Ldr. E. J. Parker, M.C. (Qtr.-Mr. Extra Regimentally employed), relinquishes his temp. R.A.F. commn. on return to Army duty; April 1. Flying Officer H. H. Giles, M.B.E. (Commissioned Writer, R.N.) relinquishes his temp. R.A.F. commn. on return to naval duty; April 1.

(Then follow the names of eight officers who are transfd. to the Unemployed List under various dates.)

The surname of Lieut. R. R. M. Nicolls is as now described, and not as stated in *Gazette* of March 23.

Technical Branch

Flight-Lieut. T. G. Gordon, M.B.E., to be Flight Lieut., Grade (B.), from (S.O.); April 13. Flying Officer F. R. Wilkins relinquishes grading for pay and allowances as Flight-Lieut. on ceasing to be employed as Flight-Lieut., Grade (A.); March 31. Flying Officer J. L. Denman to be Flying Officer, Grade (B), from (S.O.); April 1. Flying Officer E. N. Holstius (Lieut., Durh. L.I.) relinquishes his temp. R.A.F. commn. on return to Army duty; Dec. 23, 1919.

(Then follow the names of three officers who are transfd. to the Unemployed List under various dates.)

Lieut. A. H. Simpsonn (Sec. Lieut., Gen. List) relinquishes his commn. on retirement from Army; April 14.

(Then follow the names of 31 Cadets granted hon. commns. as Sec. Lieuts.)

Flying Officer G. T. Armitage (Temp. Lieut., Lab. Corps) relinquishes his temp. R.A.F. commn. on return to Army duty; Oct. 28, 1919; (substituted for notification in *Gazette*, Nov. 11, 1919). Pilot Officer H. Baker relinquishes his commn. on ceasing to be employed, and is granted rank of Capt.; April 1. *The notification in Gazette Feb. 6 concerning* Temp. Hon. Lieut. A. H. Fox is cancelled.

London Gazette, April 16

The notification in *Gazette* of Oct. 24, 1918, appointing Flying Officer J. H. Halliwell (A.) to a short service commn., is cancelled.

Staff

The following temporary appointments are made:—Col. (actg. Brig.-Gen.) T. I. Webb-Bowen, C.M.G., is graded for purposes of pay and allowances as Maj.-Gen. whilst commanding an Area; May 1, 1919. Col. (actg. Brig.-Gen.) A. V. Vyvyan, C.B., D.S.O., is graded for purposes of pay and allowances as Maj.-Gen. whilst commanding an Area; May 1, 1919.

Flying Branch

Sqdn. Ldr. P. C. Sherren is restored to Active List; April 1.

Sec. Lieut. W. J. Guppy relinquishes his commn. on ceasing to be employed; May 2, 1919.

(Then follow the names of 25 officers who are transfd. to the Unemployed List under various dates.)

Lieut. G. E. A. Lewis relinquishes his commn. on account of ill-health, and is permitted to retain his rank; April 8.

The notifications in *Gazettes* of Jan. 9 concerning Sec. Lieut. H. N. Bradbrooke (*Gazette* Nov. 25, 1919, to stand); Aug. 15, 1919, Lieut. C. Thomas (*Gazette* July 15, 1919, to stand):; May 13, 1919. Sec. Lieut. W. J. Guppy; June 6, 1919, Sec. Lieut. K. L. Vernon (*Gazette*, July 29, 1919, to stand), are cancelled.

Administrative Branch

Flight-Lieut. (actg. Sqdn. Ldr.) A. M. Wilson, M.B.E., relinquishes the actg. rank of Sqdn. Ldr. on ceasing to be employed as Sqdn. Ldr.; March 26. Capt. A. G. Macdonald to be Capt., from (A.), Sept. 12, 1918, and is graded for purposes of pay and allowances as Lieut.; Sept. 12, 1918 (substituted for notification in the *Gazette* of Sept. 24, 1918).

(Then follow the names of 17 officers who are transfd. to the Unemployed List under various dates.)

The notifications in the *Gazettes* of Dec. 9, 1919, Feb. 10 and March 16, concerning Lieut. G. W. C. Dawson are cancelled. (The notification in the *Gazette* of Feb. 10 concerning substantive promotion to Lieut., to stand.)

Technical Branch

Sqdn. Ldr. (actg. Wing Comdr.) S. S. Nevill, O.B.E., relinquishes the actg. rank of Wing Comdr. on ceasing to be employed as Wing Comdr., Grade (A); Jan. 25. Capt. W. G. Chapman to be Capt., Grade (B.), from (Ad.); Oct. 29, 1918. Sec. Lieut. (Hon. Lieut.) (actg. Lieut.) J. Drew to be actg. Capt. whilst employed as Capt., Grade (A.); Feb. 8, 1919 (substituted for notification in the *Gazette* of March 7, 1919). Flying Officer E. R. Beckwith to be Flying Officer, Grade (B.) from Grade (A.); March 23. Flying Officer F. J. W. Humphreys to be Flying Officer, Grade (B.), from (S.O.); April 1.

(Then follow the names of 19 officers who are transfd. to the Unemployed List under various dates.)

The name of Capt. Samuel Curtis is as now described, and not as stated in *Gazette* of March 23.

Memoranda

(Then follow the names of 90 Cadets granted hon. commns. and nine probationary Flight Officers granted hon. commns. as Sec. Lieuts.)

(Two officers transfd. to the Unemployed List.)

Lieut.-Col. C. Bovill, O.B.E. (late Maj., R.G.A.), having retired from the Army and relinquished his R.A.F. commn. is permitted to retain the rank of Lieut.-Col.

The following Hon. Sec. Lieuts. relinquish their hon. commns.:—A. Hedderby; Oct. 14, 1919. W. Slora; April 3.

To Our Readers

As we continually receive complaints from readers that they experience difficulty in obtaining their copy of FLIGHT promptly each week, we draw their attention to the subscription form which is printed on page xxv of the current issue. If this is sent, accompanied by the appropriate remittance, to the publishing offices, 36, Great Queen Street, W.C., it will ensure FLIGHT being received regularly each week upon the day of publication.

Aeroplanes for Bandit Catching

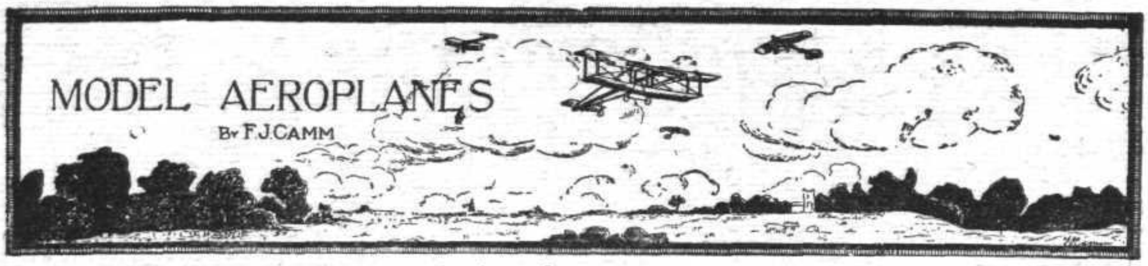
THE Chinese Government intend to utilise the Handley Page aeroplanes which they have purchased for a number of adventurous undertakings apart from commercial purposes. Gen. Timm, the organiser of the Aeronautical Department of China, recently stated that amongst the uses to which aeroplanes will be put in civil pursuits in China will be the location of bandits in Shantung and other bandit-infested provinces; location of salt and customs smugglers; coast patrols; transportation of precious metal and ore from the interior to the ports; exploration and reconnaissance of new routes—railways and highways; the running of mail services, including the carrying of important despatches between officials; transportation of officials on important missions; surveying the country and making maps, and the study of river and harbour problems.

America's Demand for Air "Taxis"

THE chief concern of the many Americans who attended Mr. Handley Page's recent lectures on aviation in the United States appeared to be to discover when air taxis would be possible.

The congestion of traffic in the streets of American cities is becoming so acute that it is suggested that if people could travel by air in large numbers, a solution of the problem would be discovered.

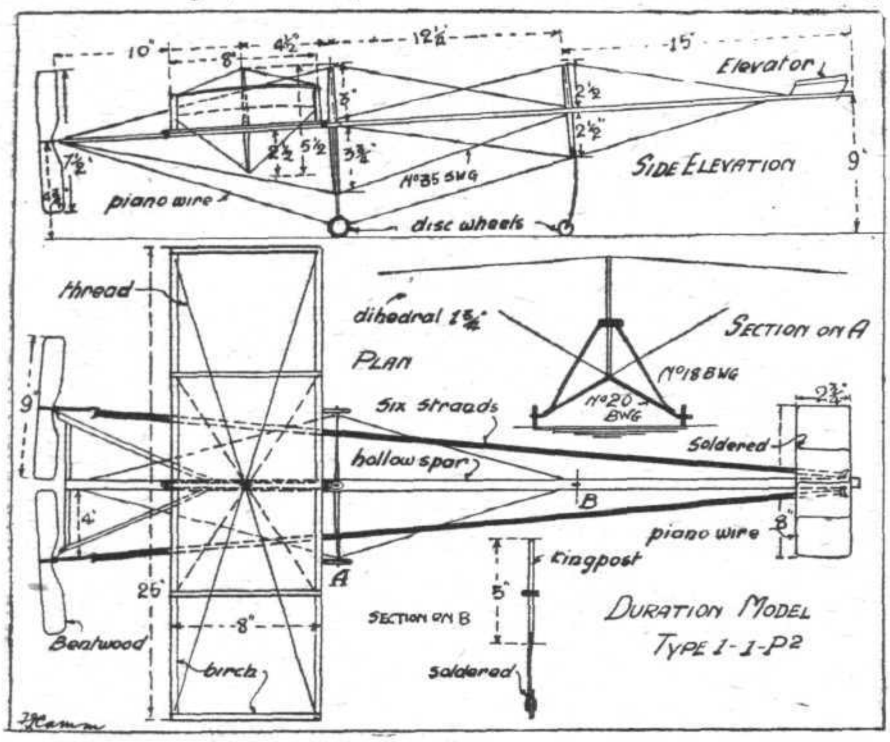
A few hours after Mr. Handley Page had told one questioner that air taxis would be possible in course of time, newspaper headlines were spread over the press announcing that "in another fifty years and the traffic policeman will be guarding the steeples." "Another fifty years and the sky will look something like Madison and State Streets on a Saturday afternoon—Frederick Handley Page, the genial ace of the English airplane industry, is certain of it!"



NOTE.—*All communications should be addressed to the Model Editor.*

A Duration Monoplane

THE accompanying drawings are of a long-duration monoplane. The mainspar is of spruce and hollow, save where the king-posts pass through, the channel at these points being either left solid or blocked with suitable packing pieces. The main plane, it will be seen, is of low aspect ratio although of large area, this to reduce resistance and therefore economise in power. The elevator is carried on crutches to raise it above the spar, in which position I find it is more efficient.



The somewhat shallow dimensions of the mainspar, which is only designed to withstand the lateral torque of the rubber skein in torsion, necessitates the use of a twin winder.

The screws are of extremely coarse pitch but small diameter —not altogether a desirable practice, but in this case necessary to reduce the weight of the chassis. The total weight of the machine is 6 ozs. bare.

Compressed Air

It has been established that a model aeroplane can be made to fly by compressed air power with a pressure of 50 lbs. per sq. in. The writer found that with a foot-pump (a hand or cycle-pump is useless) it took 50 pump strokes (1-in. bore pump) to reach 50 lbs. pressure, so that the pressure averages 1 lb. per sq. in. per pump. The great advantage of compressed air over other forms of motive power (and in this respect it is worthy of mention that the only practicable forms of power for model aeroplane purposes are rubber, superheated steam and petrol—the latter being but a qualified success) is that if it burst there are no pieces to fly about and hurt one. The power is quite safe at 200 lbs. pressure.

Dope

A good dope can be made at home when a better one is not available by using the following formula :—

Dissolve 1 lb. of powdered alum in a gallon of boiling water; stir well. When dissolved, add 5 lbs. of ground glue and allow to dissolve until the mixture has the appearance of ordinary paint. Then add about two tablespoonfuls of glycerine.

This mixture should be kept warm while using, and applied with an ordinary brush. This will shrink the fabric and fill the pores. Two coats must be applied, and then a coat of Spar varnish. Care must be taken when applying any form of dope to prevent the mixture from penetrating and coating the other side of the fabric, for then there is danger of cracking.

Some people prefer the above for a sizing coat as it is inexpensive, and a large quantity of dope is required on fabric. Again, most dopes pull the cloth too tightly, but if this is used the shrinking will be gradual.

Airscrews

Let us now deal with the action and functions of an airscrew. As with the aerofoil, so here. A vast amount of thought has been bestowed on this important portion of an aeroplane with the result that whereas formerly an airscrew efficiency of 60 per cent. was considered good, anything from 70 per cent. to 80 per cent. now obtains.

I think the Wright Brothers in their epoch-making twin-screw machines (with true helix screws) obtained as much as 70 per cent. airscrew, and this before aeroplanes had emerged from their pristine stage.

As I have remarked in earlier contributions, excellence of workmanship and design in other portions of the machine are of no avail if the means of converting the power from the engine into work are inefficient.

The problem of so designing the screw that it may absorb a maximum amount of engine power with a minimum of "slip" is rendered more difficult by the elastic nature of the air, which yields easily under the pressure applied to it by the rotation of the screw. The problem is analogous in many respects to marine screw design, and hence the designer has had the benefit of the researches of marine screw designers upon which to form at least a nucleus to base his airscrew theories on. It will be clear that greater efficiency is obtainable from a screw working in water than from one working in the air, owing to the difference in the densities of the two media (air is to water as 800 : 1). Nevertheless, even the years of science research that have been applied to marine screw design have failed to produce anything in the nature of standard to work upon, and I have it as the fact that prior to the War the *Lusitania* and *Mauretania* were fitted with different screws time and time again, so that the most efficient design might be determined.

Now, there are two very convenient ways of considering the action of an airscrew—the one, to consider it purely as a pair of aerofoils secured to a revolving axis, and the other to consider it as portion of a helix or screw.

Let us take the aerofoil theory first. In an aerofoil we have the angle of the incidence, the speed at which it is driven through the air, and, of course, the resultant lift. Have we not exactly the same factors in the airscrew?

Let us see. In an airscrew we have blades, which may be considered aerofoils, which are inclined at varying angles with the plane of rotation along their whole lengths, the angle decreasing as the distance from the centre of rotation increases. This angle is analogous to the angle of incidence. Taking the plane of rotation as equivalent to the horizontal path of flight of a mainplane or aerofoil, it is apparent that we have the two components of lift and drift precisely as with supporting or lifting surfaces.

The thrust of the revolving airscrew blades (or aerofoils) may be likened to the lift, and the drift or power required to rotate the screw may be compared to the torque or turning force of the crankshaft of the engine. So much for the bare theory.

Now for the screw theory. The propeller in this case is likened to a bolt turning in a nut, the air being the nut. Now, if we have a bolt and nut with, say, a Whitworth thread of 14 threads per inch (that is, the pitch of the threads is $\frac{1}{14}$ of an inch), one turn of the bolt in the nut is bound to take it foreward a distance equal to the pitch $= \frac{1}{14}$ of an inch. Were it not for certain resistances and the yielding nature of the air (which, be it said, is a fluid), one revolution of an airscrew with a pitch of, say, 10 ft. would move forward that distance. Actually it will only move forward perhaps 7 ft., and therefore we have 3 ft. "slip." This is usually expressed as a percentage of the theoretical pitch; in this case the screw has an efficiency of 70 per cent., and hence a "slip" of 30 per cent.

SIDE-WINDS

A LITTLE belated echo of the wonderful flight on his Vickers-Vimy-Rolls to Australia is to hand in the form of a cable from Sir Ross Smith saying: "Many thanks congratulations, machine fitted with Palmer tyres, only two small punctures one wheel, other three wheels are just as we left London, full of English air." More convincing testimony to the reliability and durability of Palmer tyres it would be hard to find. Two photographs of the machine appear on pages 452 and 453 of this issue.

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IN connection with the Aircraft Deal, Handley Page, Ltd., are organising showrooms at Cricklewood for the display of commercial aeroplanes. All kinds of aircraft, from single-seaters to multi-engined freight-carriers, will be on view. This innovation represents the first and most complete collection of aircraft, which, if required, can be flown by intending purchasers or demonstrated by the firm's pilots. It is anticipated that representatives from all over the world will make use of this exhibition. Selections of spare parts will also be shown to illustrate the fact that the huge amount of aircraft material controlled solves the urgent question of spares for aeroplanes. From existing stock it will be possible to ensure spares for any aeroplane for some years. Immediate replacement of damaged parts will be possible without the weeks of delay which generally occur.

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FROM Messrs. W. Gilbertson and Co., Ltd., of Pontardawe, comes a useful pamphlet which will acquaint engineers, automobile and aircraft manufacturers, as to the various grades of steel, each made for, and best suited to, a specific purpose, which this firm can supply. In addition to details of the various "Maximp" alloy and "Comet" carbon steels, including results of tests with the steels treated in various ways, the book contains many useful tables, charts, etc. Anyone who is interested in the subject can doubtless obtain a copy of the booklet by writing to the firm at Pontardawe, near Swansea.

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FULL of interesting facts and illustrations is a booklet which has just been issued by the Triplex Safety Glass Co., Ltd. It deals with the use of Triplex glass in connection with aviation, motoring, marine work, etc., and the advantages of Triplex are adequately brought out in many photographs and sketches. Copies of the booklet, and also a leaflet on side-car wind-screens, can be obtained by any reader from the Triplex Co., at 1, Albemarle Street, Piccadilly, W. 1.

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MR. S. T. G. ANDREWS, B.Sc., 80, Shakespeare Crescent, Manor Park, E. 12, whose correspondence courses of tuition known as The Thorough Classes have proved so helpful to many students of aeronautics, has just prepared a leaflet showing the various courses, in addition to those concerning aviation, which have been drawn up. These cover preparation for various University degrees, theory of machines and machine design, structures, materials, hydraulics, mathematics, etc., as well as commercial subjects. Mr. Andrews will be pleased to send a copy to any of our readers who are interested in postal tuition if they will apply to him at the address given above.

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FROM Barimar, Ltd., the scientific welding engineers, comes an attractively-printed folder, giving details of a new metallurgical process, which has been elaborated by the company's experts, for restoring cylinders which suffer from scored bores. The process largely owes its birth to the recent disastrous strike, which closed practically every foundry in the Kingdom, making it quite impossible to obtain new castings. Barimar's metallurgical process, designed to meet troubles of this description (which practically held-up all forms of transport suffering from cylinder-bore defects), actually cuts out three-fourths of the work and nine-tenths of the delay occasioned by the old system, and at the same time yields a repair that outlasts the cylinder, at a fractional cost of the cumbersome practice it displaces. By this new process it is claimed that Barimar is able to give what no other engineers in the world have ever even claimed—a repair that effectually withstands the heavy strains to which *air-cooled* cylinders are necessarily subjected. Details of this interesting work, and a copy of the folder, may be obtained upon application to Barimar, Ltd., 10, Poland Street, London, W. 1.

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JESSE PENNINGTON, the famous footballer and captain of the English team against Wales, is an all-round athlete and a great believer in the value of the bicycle for training. "It is a wise footballer," he says, "who keeps himself in good condition through the summer, and I can speak from experience when I say that there is no better way of keeping fit than to ride a Raleigh through both summer and winter."

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PUBLICATIONS RECEIVED

Half Past Twelve. By George W. Gough. London: Methuen and Co., Ltd. Price 1s.

Theorie Generale de l'Helice. By S. Drzewiecki. Paris: Gauthier-Villars et Cie, 55, Quai des Grands-Augustins. Price 15 fr.

Theory and Practice of Aeroplane Design. By S. T. G. Andrews, B.Sc. (Eng.), London, and S. F. Benson, B.Sc., Eng.), London. London: Chapman and Hall, Ltd. Price 15s. 6d. net.

The Wireless Transmission of Photographs. By Marcus J. Martin. London: The Wireless Press, Ltd., 12-13, Henrietta Street, Covent Graden, W.C. 2. Price 5s.

Selected Studies in Elementary Physics. By E. Blake. London: The Wireless Press, Ltd. Price 5s.

Wireless Telegraphy and Telephony. By H. M. Dowsett. London: The Wireless Press, Ltd. Price 5s.

The Light Engineering Trades of Sheffield. Development Committee, City Council, Sheffield.

Steel Tubes, Tube Manipulation and Tubular Structures for Aircraft. By W. W. Hackett and A. G. Hackett. Accles and Pollock, Ltd., Oldbury, Birmingham.

Report No. 61. Head Resistance Due to Radiators. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Works Committees and Industrial Councils. Lecture by The Rt. Hon. J. H. Whitley, P.C., M.P. Manchester: The University Press. London: Longmans Green and Co.

Wood Turning. (The Woodworker Series.) London: Evans Brothers, Ltd., Montague House, Russell Square, W.C. 1. Price 3s. 6d. net.

Willing's Press Guide, 1920. James Willing, Ltd., 125, Strand, W.C. 2. Price 2s. net.

Report No. 51. Spark Plug Defects and. Tests. The National Advisory Committee for Aeronautics, Navy Building, 17th and B Streets, N.W., Washington, D.C., U.S.A.

Position Fixing in Aircraft During Long Distance Flights over the Sea. By Instructor-Comdr. T. Y. Baker, R.N., and Maj. L. N. G. Filon, D.Sc., F.R.S., late R.A.F. London: Royal Aeronautical Society, 7, Albemarle Street, W. 1. Price 5s.

"Fly!" Aircraft Year Book, 1920. New York: Doubleday, Page and Co., 501, Fifth Avenue. Price $2.

The Theory and Practice of Lubrication: The "Germ" Process. By Henry M. Wells and James E. Southcombe, M.Sc. Society of Chemical Industry, Central House, 46-47, Finsbury Square, E.C. 2.

Aluminium Foundry Practice. The British Aluminium Co., Ltd., 109, Queen Victoria Street, E.C. 4.

Calendar, 1920. Sterns, Ltd., Royal London House, Finsbury Square, E.C. 2.

Abstract of Report No. 89. Comparison of Alcogas Aviation Fuel with Export Aviation Gasoline. By V R. Gage, S. W. Sparrow and D. R. Harper. National Advisory Committee for Aeronautics, Navy Building, 17th and B Streets, N.W., Washington, D.C., U.S.A.

Maximp Alloy and Comet Carbon Steels. W. Gilbertson and Co., Ltd., Pontardawe, near Swansea.

Triplex Unsplinterable Glass. The Triplex Safety Glass, Co., Ltd., 1, Albemarle Street, Piccadilly, W. 1.

Photography. By W. Gamble, F.R.P.S. Pitman's Common Commodities and Industries. London: Sir Isaac Pitman and Sons, Ltd. Price 2s. 6d. net.

Catalogues

Aero Stamps. Fred J. Melville, Ltd., The Philatelic Institute and Galleries, 110, Strand, W.C. 2.

Sunbeam-Coatalen Aircraft Engines. The Sunbeam Motor Car Co., Ltd., Moorfield Works, Wolverhampton.

Apollo Tubular Box Spanners. Accles and Pollock, Ltd., Oldbury, Manchester.

A National Airship Factory

IN the Cardington airship constructional works near Bedford, which have now been taken over by the Government from Messrs. Short Brothers, the Air Ministry has secured for the country what will become forthwith a national airship factory. It is understood that the Ministry has re-engaged practically the entire staff at the works, which are most up-to-date and conveniently situated.

The R.38, the rigid airship which is to be transferred to the Government of the United States, is at present being built at Cardington. The R.37 is also at Cardington receiving finishing touches, and there are also several small non-rigid airships being re-rigged.

Claims by Inventors

THE Royal Commission on Awards to Inventors recently heard evidence in connection with a claim for £8,325 by Major G. H. Norman, R.A.F., in respect of the Norman machine-gun-sight. It was stated that the R.A.F. ordered more than 20,000 of the sights at £4 15s. each. It became the official gun-sight of the R.A.F. and was adopted by America.

The Commission will consider its award.

The Commission also had before it on April 19, a claim by Capt. F. Pratt for £20,000 in respect of a system for training observers by the employment of exact models of areas of the front in France, constructed in earth, and showing every detail of the ground covered.

A claim for an award in respect of model targets by Col. A. E. T. McCullum had already been heard by the Commission.

The Committee's decision will be announced later.

COMPANY MATTERS

A.B.C. Motors (1920), Ltd.

THE directors of A.B.C. Motors (1920), Ltd., announce that letters of allotment were posted on April 8, and that all applications for 2,000 shares and under have been allotted in full.

D. Napier and Son, Ltd.

THE directors' report and balance-sheet of the company as at September 30, 1919, shows a profit amounting to £121,892 16s. 3*d*., to which is added the balance brought forward from last account, £6,073 15*s*. 10*d*., making £127,966 12*s*. 1*d*. Deduct dividend for the year on preference shares to June 30, 1919, £22,500. Deduct dividend of 10 per cent. (less income-tax) on ordinary shares paid on January 15, 1920, £45,500; leaving a balance of £59,966 12*s*. 1*d*. Having regard to the effect of the iron moulders' strike on the current year's output, the directors consider it desirable to conserve the company's financial resources and to place to general reserve a further £50,000 (making in all £145,000), and to carry forward to next year a balance of £9,966 12*s*. 1*d*. During the year covered by the accounts, the company has been engaged in completing Government contracts, and has also made good deliveries of Napier business vehicles. In addition to this a new and powerful aero engine has been designed, which has been favourably received by the British Government, who have placed a preliminary order with the company. The design for the post-War trade of the new six-cylindered 40-50 h.p. Napier private car was completed and was shown at the Olympia Motor Exhibition in November last. As will have been seen from the many press comments, this car bids fair to excel anything of this type previously built, and to further uphold the company's old-established and excellent reputation for the six-cylinder motor carriage.

IMPORTS AND EXPORTS, 1919-1920

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910). For 1910 and 1911 figures see "FLIGHT" for January 25, 1912; for 1912 and 1913, see "FLIGHT" for January 17, 1914; for 1914, see "FLIGHT" for January 15, 1915; for 1915, see "FLIGHT" for January 13, 1916; for 1916, see "FLIGHT" for January 11, 1917; for 1917, see "FLIGHT" for January 24, 1918; for 1918, see "FLIGHT" for January 16, 1919; and for 1919, see "FLIGHT" for January 22, 1920.

	Imports.		Exports.		Re-Exportation.	
	1919.	1920.	1919.	1920.	1919.	1920.
	£	£	£	£	£	£
January ...	555,989	2,323	57,571	32,752	—	697
February	453,822	9,320	57,972	68,932	—	—
March ...	704,424	2,092	72,716	67,600	400	—
	1,714,235	13,735	188,259	169,284	400	697

AERONAUTICAL PATENTS PUBLISHED

Abbreviations:—cyl. = cylinder; I.C. = internal combustion; m. = motors.

APPLIED FOR IN 1918

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published April 15, 1920

6,029. CLERGET, BLIN ET CIE. Sparking-plugs. (116,265.)
6,684. F. H. PAGE. Framework of aircraft. (140,113.)
16,475. R. C. MOTTE. Sheet metal *fuselages* or hulls. (140,127.)
16,849. SOC. ANON. DES ETAB. NIEUPORT. Mounting of I.C. engines upon aircraft. (140,129.)
20,263. J. V. MARTIN. Shock-absorbing rudders for aircraft. (140,137.)

Published April 22, 1920

15,174. R. L. DAVIES and R. D. METCALFE. Clinometer. (140,482.)
18,067. L. J. CREPLET. Automatic control of mechanism from a distance. (140,488.)
19,603, 19,604. SOC. DES MOTEURS GNOME ET RHONE. I.C. engines with radial cylinders. (140,503, 140,504.)

APPLIED FOR IN 1919

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published April 15, 1920

5,763. T. E. BIRKBECK. Mooring of dirigibles. (140,197.)
6,071. A. H. BOETTCHER. Pilot-director and bomb-dropping sight for aircraft. (124,442.)
7,094. SAUNDEVAN, LTD., and J. J. EVANS. Fire-proofing of fabrics. (140,209.)
11,867. M. E. A. WRIGHT. Toy aeroplane or mascot. (140,259.)
13,471. F. H. PAGE. Aircraft. (140,276.)
14,446. SCHNEIDER ET CIE. Speed recorder. (131,275.)
17,485. J. C. ALLSOPP. Clinometers. (140,293.)
17,670. E. A. JAMIESON and W. A. SCOBLE. Cable attachments for balloons. (140,295.)
21,195. SOC. DES MOTEURS GNOME ET RHONE. Cam-shaft driving gear. (132,250.)

Published April 22, 1920

571. SOC. DES MOTEURS SALMSON. I.C. engines. (140,529.)
608. A. P. THURSTON and H. N. WYLIE. Metal members for aircraft (140,531.)
750, 751. SOC. DES MOTEURS SALMSON. I.C. engines. (140,533, 140,534.
1,238. P. H. HEFFORD. I.C. engines with revolving cylinders. (140,537.)
1,277. I. C. LITTLE and E. E. CROOK. Aircraft. (140,539.)
2,238. SOC. DES MOTEURS SALMSON. Shock absorbers. (140,545.)
2,239. SOC. DES MOTEURS SALMSON. Measuring amount of liquid contained in receptacles. (140,546.)
4,560. W. HEMINGWAY and HEWLETT AND BLONDEAU. Change-speed gears. (140,565.)
5,447. W. B. SAYERS. Sheet-metal structures for aircraft. (140,575.)
13,103. R. JOSEPH. Toy aeroplanes. (140,657.)
18,460. A. V. ROE. *Fuselages*. (130,339.)

If you require anything pertaining to aviation, study "FLIGHT'S" Buyers' Guide and Trade Directory, which appears in our advertisement pages each week (see pages xxvi, xxvii and xxviii).

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